EOSDIS Core System Project

Interface Control Document Between EOSDIS Core System (ECS) and the ESDIS Level 1 Product Generation System (LPGS)

This document has not yet been approved by the Government for general use or distribution.

July 1997

Hughes Information Technology Systems
Upper Marlboro, Maryland

Interface Control Document Between EOSDIS Core System (ECS) and the ESDIS Level 1 Product Generation System (LPGS)

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SUBMITTED BY

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This Interface Control Document (ICD) defines the functional and physical design of each interface between ECS and the Level 1 Product Generation System (LPGS) and includes the data contents and format for each interface. Additionally, data rates, frequencies, file sizes, error conditions, and error handling procedures and security are included or a place holder has been inserted for updating as the information becomes available. The sequence of exchanges is described, as are the details for communications protocols or physical media for each interface.

In particular, this ICD describes data flows from ECS to LPGS (e.g., user requests for Level 1 R/G products, and the L0R data needed to produce the Level 1 R/G products), and data flows from LPGS to ECS (e.g., L0R acquire requests, and the Level 1 R/G products). In addition, the internetworking between ECS and the EDC Campus via external networks is described herein.

This ICD includes the precise data contents and format for each interface addressed in this document. State diagrams are provided which identify all states, and events/conditions. Error handling procedures, and security are included. Communications protocols or physical media are also addressed for each interface.

This ICD is consistent with the external systems interface requirements at the EDC, as described in the Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements and, the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS level 3 requirements).

Keywords: active, archive, ECS, DAAC, DCE, EBnet, ftp, EDC, Level0R, L0R, Level1G, Level1R, Level1R/G, L1R, L1G, LPGS, ODL, PAN, PDR, PDRD, product delivery record, product delivery record discrepancy, production acceptance notification, PVL.

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1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirements List (CDRL) Item 029 whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Scope

This Interface Control Document (ICD) defines the EDC interfaces between ECS and the Level 1 Product Generation System (LPGS) for ordering and distributing, via ECS, Level1R/G products generated by the LPGS; and provision, by ECS, of the requisite L0R data to LPGS, for the ECS Release B. This ICD does not explicitly define the ECS user interface for conducting metadata searches, or selecting/viewing browse images.

ECS Releases are keyed to mission support: Release B provides support to EOS AM-1 Mission Operations and Science Operations, and it provides support to ESDIS Ground System Certification Testing for the EOS AM-1, Landsat 7 and SAGE III missions. Release B also provides archive and distribution services for the Landsat 7 mission. Early ECS/LPGS interface testing is supported by the pre-Release B Testbed. Releases C & D provide evolutionary enhancements to the ECS services provided in the earlier Releases.

The Earth Science Data and Information System (ESDIS) Project has responsibility for the development and maintenance of this ICD. Any changes in the interface requirements must be agreed to, and assessed at the ESDIS Project Level. This ICD will be approved under the signature of the ESDIS Project Manager in coordination with the LPGS Project Configuration Management Board (PCMB).

This document reflects the technical baseline maintained by the ECS Configuration Control Board in accordance with ECS technical direction (see Section 2.2).

1.3 Purpose and Objectives

This document is written to formalize the interpretation and general understanding of the interfaces between ECS and the LPGS. This document is intended to provide clarification and elaboration of the ECS/LPGS interfaces at the EDC DAAC to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of external interface definitions between the ECS and the EDC DAAC via the ESDIS Configuration Control Board (CCB).

1.4 Status and Schedule

This is the preliminary ICD for the ECS/LPGS interfaces at the EDC DAAC which will be implemented in ECS Release B. This ICD has been submitted as an ECS Project CCB approval Code 1 document. At the Government's option, this document may be designated to be under full Government CCB control. Changes may be submitted for consideration by Contractor and Government CCBs under the normal change process at any time.

Within this document are some interfaces that are yet To Be Determined (TBD), To Be Resolved (TBR), and/or To Be Supplied (TBS) items. A Work-Off Plan is included in Appendix A for resolving these items. This plan provides the following information:

    a. ICD I/F Issue Number

    b. ICD Reference Paragraph

    c. ICD Issue Priority

    d. ICD Issue Type - Description

    e. Work-off Plan Task(s)

    f. Projected Resolution Date

    g. Risk Assessment.

1.5 Organization

This document is organized in 5 sections:

    a. Section 1 provides information regarding the identification, scope, purpose and objectives, and organization of this document.

    b. Section 2 contains information about documentation relevant to this ICD, including parent, applicable, and information documents.

    c. Section 3 provides an overview of the interfaces, with a brief description of the elements involved.

    d. Section 4 provides an overview of the data exchange approaches.

    e. Section 5 contains a description of each data flow between the ECS and the LPGS, descriptions of the data format, and operations concepts.

    f. Section 6 contains interface functional and performance interface requirements.

    g. Appendix A contains requirements traceability.

    h. Appendix B contains a table which identifies a Work-off Plan for all TBRs, TBSs and/or TBDs.

    i. Appendix AB contains a list of abbreviations and acronyms.

2. Related Documentation

2.1 Parent Documents

The following are parent documents from which this document's scope and content derive:

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
301-CD-002-003	System Implementation Plan for the ECS Project
423-10-01-5	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project Level 2 Requirements, Volume 5: EOSDIS Version 0
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
505-10-20	Goddard Space Flight Center, System Interface Control Plan for the Earth Science Data and Information System (ESDIS) Project
560-3OCD/0194	Landsat 7 Processing System (LPS) Operations Concept Revision 1
GSFC 510-xxxxxx	Landsat 7 Processing Facility (LPF) Project Management Plan
GSFC 510-xxxxxx	Level 1 Product Generation System (LPGS) Project Management Plan
none	Goddard Space Flight Center, Inter-project Agreement between the Landsat Project and the Earth Data and Information System Project for the Landsat 7.
GSFC 505-41-13	Interface Requirements Document between the Earth Observing System Data and Information System (EOSDIS) and the Landsat 7 System
423-10-36	ESDIS Project Mission Specific Requirements for the Landsat 7 Mission Level 1 Processing

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this ICD, this document shall take precedence. Please note that Internet links cannot be guaranteed for accuracy or currency.

305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS Management Subsystem Design Specification for the ECS Project
311-CD-008-001	Release B Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
311-CD-003-005	Communications and System Management Segment (CSMS) Database Design and Database Schema Specifications for the ECS Project
313-CD-006-002	Release B SDPS/CSMS Internal Interface Control Document for the ECS Project
819-RD-001-001	EOSDIS Core System (ECS) Application Programming Interface (API) Interface Definition Document (IDD)
170-TP-005-002	HDF-EOS Library User's Guide for the ECS Project, Volume 1: Overview and Examples
170-TP-006-001	HDF-EOS Library Users Guide for the ECS Project, Volume 2: Function Reference Guide
210-TP-001-006	Technical Baseline for the ECS Project
420-TP-015-001	B.0 Earth Science Data Model for the ECS Project
420-TP-016-001	Backus-Naur Format (BNF) Representation of the B.0 Earth Science Data Model
540-032	Goddard Space Flight Center, EBnet - Distributed Active Archive Center (DAAC) Interface Control Document (ICD)
510-3DFC/0197	ESDIS Level 1 Product Generation System (LPGS) Output Files Data Format Control Book (DFCB)
430-11-06-007-0	Landsat 7 System Zero-R Distribution Product Data Format Control Book, vol. 5, Book 1
510-3FCD/0195	Landsat 7 Processing System (LPS) Output Files Data Format Control Book
430-15-01-002-0	Calibration Parameter File Definition

CCSDS 641.0-B-1	Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book
420-TP-017-001	B.1 Earth Science Data Model
none	Goddard Space Flight Center, ECS Technical Direction No. 11, "PDR Technical Baseline," 12/6/94
none	Goddard Space Flight Center, Science Data Plan for the EOS Data and Information System Covering EOSDIS Version 0 and Beyond, Document Version 3, 7/94
none	Davis, Randy; University of Colorado Laboratory for Atmospheric and Space Physics: User's Guide for the Object Description Language (ODL) Processing Software Library, Release 2.1 DRAFT, 3/13/91
none	Planetary Data System Standards Reference, Version 3.1, 8/94 (WWW access: http://stardust. jpl.nasa.gov/stdref/stdref.html)
RFC 791	Internet Protocol, J. Postel (WWW access: gopher://ds.internic. net:70/)
RFC 793	Transmission Control Protocol, J. Postel (WWW access: gopher://ds.internic.net:70/)
RFC 821	Simple Mail Transfer Protocol (SMTP)
RFC 959	File Transfer Protocol, Internet Standards, J. Postel, J. Reynolds (WWW access: gopher://ds.internic.net:70/)
RFC 1157	A Simple Network Management Protocol (SNMP), J. Case, M. Fedor, M. Schoffstall, J. Davin (WWW access: gopher://ds. internic.net:70/)

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

604-CD-001-004	Operations Concept for the ECS Project: Part 1-- Overview
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- Release B
194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project

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3. Interface Overview

The Level 1 Product Generation System (LPGS), located at the U. S. Geological Survey (USGS) Earth Resources Observation System (EROS) Data Center (EDC) in Sioux Falls, South Dakota, is required to produce Level 1R/G data products by processing Landsat 7 ETM+ Level 0R data. ECS is responsible for providing ordering and distribution support for the Level1R/G data products generated by the LPGS. The Level1R/G products will be ordered via the ECS client, produced on-demand by the LPGS, packaged by the LPGS into a format developed by the Landsat 7 and ESDIS Projects, and forwarded to the ECS for output to media and subsequent distribution to the customer.

3.1 ECS - LPGS Overview

The ECS and the LPGS work in coordination to provide ETM+ Level 1R/G product ordering, accounting, billing, production, distribution, and user services. The Level 1 processing facilities consist of ECS components and the LPGS installed at the EDC DAAC.

3.2 ECS - LPGS Interfaces

System interfaces between ECS and the LPGS provide the means for transferring Level 1R/G products, Landsat 7 L0R data, and for sending messages supporting data transfer. Table 3-1 provides an overview of the interfaces between ECS and the LPGS for L1R/G products, L7 L0R data, and associated metadata; along with the information required to implement the interfaces. The interfaces listed in Table 3-1 are described within Sections 4 and 5 of this ICD to support ECS and LPGS design and test activities.

Table 3-1. ECS-LPGS Interfaces

Source	Destination	Message	Data	Transfer Mechanism
ECS	LPGS	User Request File (URF)	User Request Information	ftp
LPGS	ECS	URF Acknowledgment (URFA)	N/A	ftp
LPGS	ECS	Authentication Request	N/A	TCP/IP
ECS	LPGS	Authentication Response	N/A	TCP/IP
LPGS	ECS	Acquire Request	N/A	TCP/IP
ECS	LPGS	Acquire Request Acknowledgment	N/A	TCP/IP
LPGS	ECS	Close Session Message	N/A	TCP/IP
ECS	LPGS	Data Availability Notice (DAN)	N/A	TCP/IP
LPGS	ECS	Data Availability Acknowledgment (DAA)	N/A	TCP/IP
ECS	LPGS	N/A	L7 L0R Data	ftp
LPGS	ECS	Data Delivery Notice (DDN)	N/A	TCP/IP
ECS	LPGS	Data Delivery Acknowledgment (DDA)	N/A	TCP/IP
LPGS	ECS	Product Delivery Record	N/A	ftp
ECS	LPGS	Product Delivery Record Discrepancy*	N/A	ftp
LPGS	ECS	N/A	L1R/G Products	ftp
ECS	LPGS	Production Acceptance Notification	N/A	ftp

 *This message is used only in the event of an error in the Product Delivery Record

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4. Data Exchange Framework

Section 4 describes the data exchange framework supporting the ECS - LPGS interfaces presented in Section 3.2. The descriptions include network topologies, internetworking protocols, electronic data exchange, data exchange interfaces, physical media data exchange, data exchange formats and data exchange security. Section 5 describes the data flows between ECS and the LPGS.

4.1 Internetworking Protocols and Network Topology

ECS provides internetworking services that are based on protocols and standards corresponding to layers 1 through 4 of the Open Systems Interconnection (OSI) Reference Model, specified in RFC 1510--these include, respectively, the physical, datalink, network, and transport layers. The transport layer protocol provides data consistency functions. The network, datalink and physical layers play significant roles in defining external interfaces (i.e., between ECS and non-ECS networks/systems). In particular, ECS routers provide the physical demarcation points between ECS networks and external networks/systems--the routing software (resident within routers) provides network layer services, while the interfaces on the router make up the datalink/physical layers.

4.1.1 Transport Layer Protocol

The transport layer protocol used for communications between ECS processes and the LPGS is the Transmission Control Protocol (TCP) specified in RFC 793. TCP is a connection-oriented, end-to-end reliable protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. It provides for reliable inter-process communication between pairs of processes in host computers attached to networks within and outside of ECS.

The interface between TCP and an application process consists of a set of calls much like the calls an operating system provides to an application process for manipulating files. For example, there are calls to open and close connections and to send and receive data on established connections. TCP can also asynchronously communicate with application programs such as those based on Distributed Computing Environment (DCE).

4.1.2 Network Layer Protocols

The network layer provides the functional and procedural means to exchange network data units (i.e., packets) between devices over network connections, both for connection-mode and connectionless-mode communications. It relieves the transport layer of any concern regarding routing and relay operations associated with network connection. The basic function of the network layer is to provide the transparent transfer of data between devices. It should be noted that the network layer delivers packets only to a device, not an individual process--it remains up to the transport layer protocol to include, beforehand, the additional information needed to

permit addressing to an individual process. Network layer protocols supported by ECS networks include Internet Protocol (IP) plus various routing protocols.

4.1.2.1 Internet Protocol (IP)

The Internet Protocol (IP), specified in RFC 791 is the network protocol that ECS supports, based on its dominance in industry usage and wide-community support. As part of IP support, Internet Control Message Protocol (ICMP) and Address Resolution Protocol (ARP) are also supported. As the Internet Engineering Task Force (IETF)-specified new generation IP becomes available for deployment, it will be supported by ECS networks.

4.1.2.2 Routing

ECS generally uses Routing Information Protocol (RIP) for route exchanges with external networks. Other more robust routing protocols such as Border Gateway Protocol (BGP-4) can also be used depending on the need and center routing policies. The specific routing implementation at EDC is specified in the EBnet Distributed Active Archive Center (DAAC) ICD.

4.1.3 Physical/Datalink Layer Protocols and Network Topology.

At the EDC DAAC the LPGS interfaces to ECS via the EDC Exchange LAN. This topology is depicted in Figure 4-1.

4.2 Communications Protocols

ECS provides various communications services that are based on protocols and standards corresponding to the applications level of the Open Systems Interconnection (OSI) Reference Model. Some of these services include the Simple Mail Transport Protocol (SMTP) and File Transfer Protocol (ftp).

4.2.1 Simple Mail Transport Protocol (SMTP)

All electronic mail (e-mail) message exchange is achieved through the use of Internet e-mail messages. The protocol for Internet e-mail transfer is the Simple Mail Transfer Protocol (SMTP) defined in RFC 821.

4.2.2 File Transfer Protocol (ftp)

File transfers between ECS and the EDC DAAC Data Link Server are accomplished through the use of standard File Transfer Protocol (ftp). FTP, as described in RFC 959, is an Internet standard for file transfers that support downloading of files, by a user (acting as a client), from a remote server.
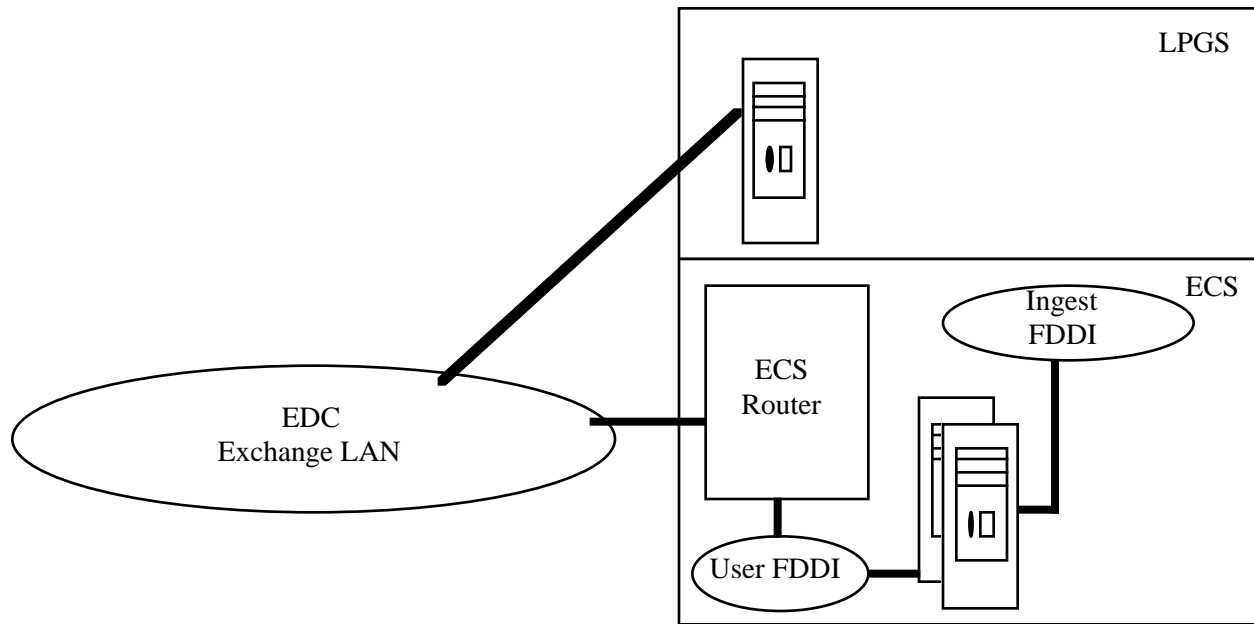
Figure 4-1. ECS - LPGS Network Topology

4.3 Data Exchange Between ECS and LPGS

Data exchange between the ECS and the LPGS consists of L0R provided by ECS to LPGS, and Level 1 R/G products provided by LPGS to ECS for distribution to the user. The L0R data sets are described in the Landsat 7 System Zero-R Distribution Product Data Format Control Book, vol. 5, 430-11-06-007-0. The Level 1 R/G data sets are described in the Level 1 Product Generation System (LPGS) Output Files Data Format Control Book. L0R data transfer is accomplished through the use of the Acquire process, as defined in the Release B SDPS Data Server Subsystem (DSS) Design Specification for the ECS Project. L1R data transfer is accomplished through the use of the ECS Polling Ingest with Product Delivery Record process, as defined in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. The ECS Polling with Product Delivery Record process is based upon the heritage of the ECS to Landsat-7 Image Assessment System (L7 IAS) interface design, as described in the ICD Between ECS and the Landsat 7 System, 423-41-32.

ECS supports the reception of user requests for on-demand Level 1 processing, and temporary storage and distribution of the resultant product back to a user---the production of the Level 1 products is performed external to ECS by the LPGS. In response to a user's search of L0R data for generation of L1 products, an identification of the corresponding (needed) L0R granules will be returned, along with an indication of an available on-demand production service. If the user selects this service, a form is presented to the user which allows him/her to specify processing instructions. The processing instructions include the desired subset of Landsat 7 L0R along with processing parameters.

A scenario describing the sequence of gateway and handshake control messages, and file transfers needed to support the ordering and distribution of Level 1 R/G data products by ECS is illustrated in Figure 4-2, and described in the paragraphs which follows.

1. User request for Level 1 R/G product is validated by the ECS Client, and then forwarded via the ECS Data Management System (DMS) to the ECS Data Server Subsystem (DSS) for processing. The DSS, using its standard interface for on-demand requests, forwards the request to the ECS Planning Subsystem (PLS). The DSS keeps a record of the request to be subsequently used for matching subscription notices with requests.

2. PLS manages on-demand requests and "thresholds (meters)" these requests to ensure that certain limits (e.g., CPU, estimated wall-clock time, RAM estimates, etc.) are not exceeded. (After placing a subscription with the DSS for the resultant Level 1 Product insert notification) PLS places the metered requests in a User Request File (URF) in a specific directory. [Note: URF contains user request parameters, an identifier for the L0R subset (i.e., UR and scan lines defining subset) required for processing, and a request ID assigned by ECS].

3. LPGS periodically polls the directory containing the URF, and upon recognizing new requests, FTPs the request file(s) to its local disk where the information is read.

4. LPGS sends a URF Acknowledgment to the PLS (via ftp), indicating, either, that the URF information has been successfully read, or any problems that have been encountered. If problems have been identified, the URFA is displayed via a Graphical User Interface (GUI), and an operator is notified. PLS saves the processed URF for historical purposes.

5. (Assuming that URF information has been successfully read by LPGS, and that LPGS has been appropriately authenticated by ECS) Using the UR and scan line information contained in the URF, LPGS issues a data Acquire Request to the DSS via the ECS Gateway (GW)---the GW converts TCP/IP sockets (on the LPGS side) to DCE (on the ECS side).

6. The DSS returns, via the GW, a L0R Acquire Acknowledgment to LPGS. [The LPGS then closes the TCP/IP socket connection].

7. The DSS stages the L0R Subsetted Data on ECS disk space

8. (Assuming that ECS has been appropriately authenticated by LPGS) The DSS sends (via TCP socket connection through the GW) , a Data Availability Notice (DAN) to the LPGS, announcing that the L0R data is ready for pick-up, and identifying the ECS disk space location where the L0R data are staged.

9. LPGS returns a Data Availability Acknowledgment (DAA) to ECS (via TCP socket connection through the GW), providing the status of the DAN. Any errors in the DAN are corrected and a new DAN is submitted.

10. (Assuming that the DAN is error-free) LPGS pulls (via ftp get) the L0R data.

11. (Assuming that LPGS has been appropriately authenticated by ECS) LPGS sends, via TCP socket connection, a Data Delivery Notice (DDN) to ECS (via GW), providing the status of the L0R data transfer/archival.

12. DSS returns, via TCP socket connection (via GW), a Data Delivery Acknowledgment (DDA), acknowledging receipt of the DDN.

13. After producing the Level 1 R/G product, LPGS stages this product on LPGS disk space.

14. LPGS places a Product Delivery Record (PDR) in a known location on LPGS disk space where the Level 1 R/G product is stored.

15. ECS INS polls the LPGS disk space, and detects/acquires/validates the PDR.

16. If and only if there are errors encountered in the PDR, ECS will return a PDRD (via ftp "put") to LPGS.

17. ECS pulls (via ftp get) the Level 1 R/G product from LPGS disk space. These products are read and ingested. Ingest (INS) sends DSS an insert request.

18. DSS, based on the insert request from INS, stores the Level 1 data---there is no requirement to permanently archive this data---and triggers the distribution of the product to the requesting user, and potentially any other users who may have an active subscription for the product. Note: The system will also be configured with a subscription for the PLS "on demand" Manager to be notified on the insert of the Level 1 product. This notification will be used by the "on -demand" manager to signal the release of another queued request to LPGS. DSS will provide temporary storage of the Level 1 data products for at least 72 hours.

19. INS sends a PAN (via ftp "put") to LPGS indicating that Level 1 R/G product has been successfully read/ingested/stored, or specific errors that have been encountered.

20. DSS sends (via DMS) a notification to the user via the ECS Client indicating that the Level 1 R/G product has been staged and is ready for pick-up.

21. The Level 1 R/G product is delivered to the user via the ECS Client.

Note 1: Level 1 R/G production cancellation requests may be placed by users via ECS, where they will be displayed to the EDC DAAC operator (flow not depicted in Figure 4-2). The EDC DAAC operator will communicate this request to the LPGS operator via phone or e-mail.

Note 2: Status information (e.g., in process, in queue, in shipping, shipped, rejected) is provided to the user via ECS.
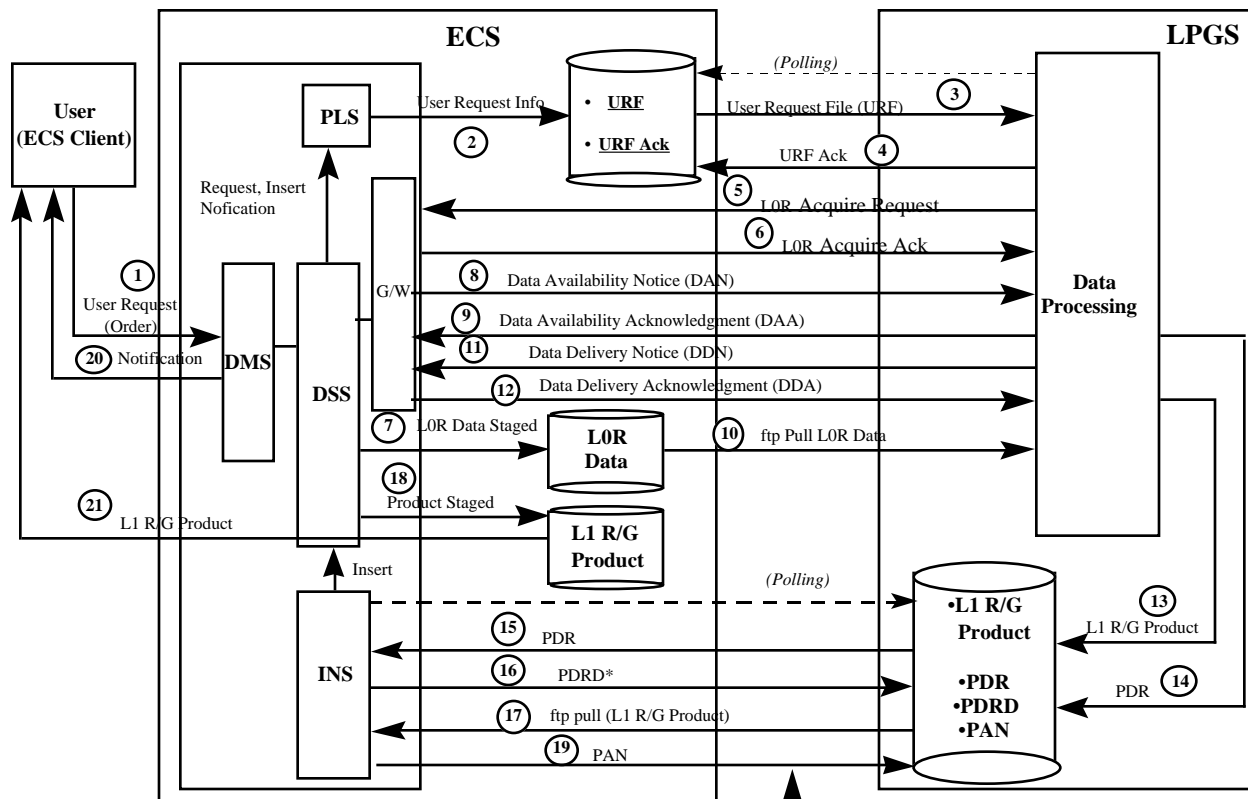
Figure 4-2. LPGS/ECS Interfaces For Generation/Distribution of Level 1 R/G Products

4.3.1 L0R Data Exchange From ECS to LPGS

L0R data files, described in Section 5.1, are transferred from ECS to LPGS using the (automated) acquire process, as defined in the Release B SDPS Data Server Subsystem (DSS) Design Specification for the ECS Project. The transfer process is TCP/IP based and involves both the exchange of control messages and file transfer using standard ftp as the protocol for LPGS-ECS L0R data transfers (4.2.2).

4.3.1.1 Handshaking and Control Message Sequence

As depicted in Figure 4-3, ECS makes the User Request File available to LPGS by placing this file in a directory on ECS disk space which is known and polled periodically by the LPGS. LPGS, the session controller, detects/acquires/reads the User Request File (URF). After performing quality checks on the request parameters, LPGS returns, via ftp put, a URF

LPGS

ECS

CONTROLLER

(Polling)

User Request File (URF)   [ftp get]

User Request File Acknowledgment (URFA)   [ftp put]

< TCP/IP Socket Connection Establishment >

Authentication Request

CONTROLLER

Authentication Response

Acquire Request

Acquire Request Acknowledgement

Close Session Message

< TCP/IP Socket Connection Establishment >

Authentication Request

Authentication Response

Data Availability Notice (DAN)

CONTROLLER

Data Availability Acknowledgement (DAA)

< TCP/IP Socket Connection Termination >

CONTROLLER

ftp get

Level 0R Data File(s)

< TCP/IP Socket Connection Establishment >

Authentication Request

CONTROLLER

Authentication Response

Data Delivery Notice (DDN)

Data Delivery Acknowledgement (DDA)

Close Session Message

————— File   — — — Message

Figure 4-3. LPGS/ECS Interface for L0R Data Exchange

Acknowledgment (URFA) to ECS indicating either that the URF has been successfully read by LPGS, or an identification of any problems encountered. The URFA returned to the ECS is made accessible to the PLS. Identified problems will be fixed and the affected URF will be re-submitted for processing.

If no errors are found in the URF, the LPGS initiates an application program-to-application program TCP/IP connection with ECS. LPGS, the session controller, sends an Authentication Request to ECS (via the GW) which performs an authentication check to verify privileges and returns an Authentication Response. Any rejection of the Authentication Request causes the TCP connection to be broken by ECS after ECS returns the Authentication Response. The controller may not transmit any queued messages until successful completion of the authentication process.

After LPGS receives the Authentication Response (via the GW) indicating successful authentication, it uses the supplied Universal Reference (UR) and scan line information in the URF to issue a data Acquire Request, via a Gateway (GW), to the ECS Data Server Subsystem (DSS).   The GW converts TCP/IP sockets (on the LPGS side) to DCE (on the ECS side). ECS (DSS) then returns an Acquire Request Acknowledgement message, via the GW, to the LPGS. Once LPGS has received the Acquire Request Acknowledgement message, it sends a close session message, thereby terminating the TCP connection.

After staging the L0R data on ECS disk space, ECS establishes a TCP/IP socket connection. ECS then sends a Data Availability Notice (DAN) to the LPGS via the TCP/IP connection through the GW. After validating the DAN, the LPGS returns a Data Availability Notice (DAA) to ECS (via the GW) indicating the status of the DAN. Any errors in the DAN are fixed, and the DAN is resubmitted. Once the last outstanding DAA within a given session is received by ECS, ECS terminates the TCP/IP socket connection.

Once the L0R data have been successfully transferred to the LPGS, the LPGS establishes a TCP/IP socket connection to ECS (via the GW). After successful authentication of LPGS by ECS (via authentication request/response described above), the LPGS sends a Data Delivery Notice (DDN) to ECS indicating the status of the L0R data that have been transferred. It should be noted that ECS will not delete L0R files until it has received a successful DDN from the LPGS---the deletion of these files is also subject to the total disk space available to ECS. ECS returns a Data Delivery Acknowledgment (DDA) to LPGS (via the GW) indicating that the DDN has been read. The LPGS then sends a close session message to ECS, thereby terminating the TCP/IP socket connection.

4.3.1.2 URF and Control Messages: Format and Contents Overview

The URF identified in Table 4-1 is described in Section 4.3.1.3. The control messages identified in Table 4-1 are described in Sections 4.3.1.5 - 4.3.1.11, 4.3.1.13 and 4.3.1.4. The messages vary in purpose, length and format. Some messages are strictly handshaking messages, while others relate to requisite information to support data transfer.

Table 4-1. URF and Data Exchange Control Messages

File/Message Name	Purpose	Description
User Request File (URF)	Ordering Level 1 R/G products from LPGS.	User request information, including user parameters, L0R pointer and request ID. Used to order Level 1 R/G products from LPGS.
URF Acknowledgment	Acknowledgment of L0R URF data transfer.	Notification to ECS from LPGS that URF data has been transferred and ingested by LPGS.
Authentication Request	TCP Session Authentication	Request for authentication, required for each new TCP session.
Authentication Response	TCP Session Authentication	Notification of authentication check results
Acquire Request	Order L0R data.	Orders products from ECS which are currently in the archive.
Acquire Request Acknowledgment	Acknowledge receipt of Acquire Request	Acknowledges receipt and disposition of Acquire Request
Close Session Message	Notification to the ECS Gateway of intent to terminate TCP session.	Notifies the ECS Gateway that the sender intends to terminate the TCP/IP socket connection.
Data Availability Notice (DAN)	Notification of L0R Data Ready for Transfer	Notification from ECS to LPGS that L0R data is staged and ready for transfer. Includes the following information: locations from where the data can be pulled and list of granules (files) buffered for retrieval.
Data Availability Acknowledgment (DAA)	Corresponding handshake/control message for the DAN	Acknowledges receipt and provides disposition of the DAN.
Data Delivery Notice (DDN)	Announces status of L0R data transfer and archival.	Provides the status of the L0R data transfer and archival.
Data Delivery Acknowledgment	Corresponding handshake/control message for the DDN	Acknowledges receipt and provides disposition of the DDN.

The message formats contain both fixed and variable length strings. A zero byte (NULL character) is used to terminate each variable length field in the manner of the C programming language, except for the DAN Parameter Value Language (PVL) Statements which use a semicolon as the delimiter for each field. Field lengths are specified in terms of bytes, where a byte is equal to an octet, i.e., 8 bits. The specified field lengths apply only to the parameter value and do not include the field delimiters. All fields designated as variable ASCII strings may vary in length up to the maximum field size.

The order of transmission of a group of bytes is the normal order in which they are read in English. Whenever a byte represents a numeric quantity, the left most bit in the message table is the high order or most significant bit. Similarly, whenever a multi-byte field represents a numeric quantity, the left most bit of the whole field is the most significant bit; the most significant byte is transmitted first.

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When a control message contains errors or is sent in inappropriate sequence, it is rejected, and the message source receives notification from the message destination. Error conditions for each of the messages described in Sections 4.3.1.5 through 4.3.1.9, 4.3.1.11 and 4.3.1.12 include out-of-bound parameter values, invalid parameter values, and missing parameter values (e.g., message type). In most cases, the message is corrected and resent with the exception of the Authentication Request. Rejection of an Authentication Request (as denoted by the Authentication Response) causes the TCP connection to be broken.

4.3.1.3 User Request File (URF)

The user request (order) is submitted by the user (via the ECS Client) to ECS Data Server Subsystem (DSS). The following information is typical of that contained the URF (A complete set of URF PVL parameters are defined in Table 4-2):

    a. User Request Parameters, including:

        1. selected scene/subinterval identifier

        2. geographic area

        3. WRS scene identifier

        4. L1R or L1G product selection

            coordinate reference system for map projection (support of 7 map projections, minimum, required

        5. projection-specific parameters

        6. nominal path or North-up orientation

        7. grid cell size

        8. output product format

        9. resampling filter

        10. selected band(s)

        11. internal calibrator (IC) or calibration parameter file (CPF)

    b. Request ID (assigned by ECS)

    c. L0R Pointer (points to L0R subset needed to produce Level 1 R/G product)

        1. Universal Reference (UR)

        2. scan lines defining the subset

The file naming convention for the URF is defined in Table 4-3 (an example is depicted in Figure 4-4).

Table 4-2. URF ODL Parameters (1 of 4)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of Delivery Record	Fixed String	ASCII (20)	'ECS'
REQUEST_ID	Unique ID assigned by ECS to user request	Variable String	ASCII (20)	Unique ID set equal to the Request ID defined in the Acquire Request message
UNIVERSAL_REFERENCE	Reference ID for L0R product that will be processed			Unique
SCAN_LINE_START	Scan line start number for product	Integer	ASCII (5)	1 to ?
SCAN_LINE_END	Scan line stop number for product	Integer	ASCII (5)	1 to ?
NAME	Name of customer (Last, First, MI)	Variable String	ASCII (30)	Unique name
ADDR_1	Address of customer	Variable String	ASCII (30)	Unique address
ADDR_2	City, state and zip of customer	Variable String	ASCII (30)	Unique address
ADDR_3	Country of customer	Variable String	ASCII (20)	Unique address
PHONE	Phone number of customer	Variable String	ASCII (20)	Unique phone number
E_MAIL_ADDR	e-mail address of customer	Variable String	ASCII (35)	Unique e-mail address
PRODUCT_TYPE	Product selected	Fixed String	ASCII (3)	'L1R' or 'L1G'
ORIENTATION	Selected orientation for L1G products	Fixed String	ASCII (3)	'NOM' or 'NUP'
OUTPUT_FORMAT	Output format selected for product (FAST-C and GeoTIFF apply to L1G products, only)	Variable String	ASCII (7)	'HDF-EOS', 'FAST-C' or 'GeoTIFF'
CALIBRATION_METHOD	Calibration method selected for product	Fixed String	ASCII (3)	'CPF' or 'ICG'
RESAMPLING_OPTION	Resampling option selected for product (L1G products only)	Fixed String	ASCII (3)	'NNR', 'CCN', or ' MTF'
PROJECTION	Projection selected for product (L1G products only)	Variable String	ASCII (3)	'SOM', 'UTM', 'LCC', 'TM', 'OM', 'PC', 'PS'
ELLIPSOID	Ellipsoid selected for product (L1G products only)	Fixed String	ASCII (5)	'WGS84'
DATUM	Datum selected for product (L1G products only)	Fixed String	ASCII (5)	'WGS84'

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Table 4-2. URF PVL Parameters (2 of 4)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
BAND_COMBINATION	Bands present indicator for the product ordered	Fixed String	ASCII (9)	'N' or 'Y' for each band in the following order: 1, 2, 3, 4, 5, 6L, 6H, 7, and 8
OBJECT	Start of Grid Cell group (Repeatable for each selected band)	Fixed String	ASCII (15)	'GRID_CELL_GROUP'
BAND_TYPE	Band type	Fixed String	ASCII (1)	'T', 'R' or 'P'
GRID_CELL_SIZE	Grid cell size for the band type	32-bit integer	ASCII (6)	15.000 to 60.000 (in increments of 0.001) meters
END_OBJECT	End of Grid Cell group	Fixed String	ASCII (15)	'GRID_CELL_GROUP'
OBJECT	Start of UTM group	Fixed String	ASCII (9)	'UTM_GROUP'
ZONE_NUMBER	The zone number for the UTM projection	Integer	ASCII (4)	1-9999
END_OBJECT	End of UTM group	Fixed String	ASCII (9)	'UTM_GROUP'
OBJECT	Start of LCC group	Fixed String	ASCII (9)	'LCC_GROUP'
LATITUDE_OF_FIRST_STAND ARD_PARALLEL	The latitude of first standard parallel for LCC projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
LATITUDE_OF_SECOND_STA NDARD_PARALLEL	The latitude of second standard parallel for LCC projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
LONGITUDE_OF_CENTRAL_ MERIDIAN	The longitude of central meridian for LCC projection	32-bit integer	ASCII (12)	-180.0*10 to +180.0 degrees
LATITUDE_OF_PROJECTION _ORIGIN	The latitude of projection origin for LCC projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
FALSE_EASTING	False easting for LCC projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
FALSE _NORTHING	False northing for LCC projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
END_OBJECT	End of LCC group	Fixed String	ASCII (9)	'LCC_GROUP'
OBJECT	Start of TM group	Fixed String	ASCII (8)	'TM_GROUP'
SCALE_FACTOR_AT_CENTR AL_MERIDIAN	The scale factor at the central meridian for TM projection	32-bit integer	ASCII (9)	0.0 to 2.0
LONGITUDE_OF_CENTRAL_ MERIDIAN	The longitude of central meridian for TM projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees

Table 4-2. URF PVL Parameters (3 of 4)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
LATITUDE_OF_PROJECTION _ORIGIN	The latitude of projection origin for TM projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
FALSE_EASTING	False easting for TM projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
FALSE _NORTHING	False northing for TM projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
END_OBJECT	End of TM group	Fixed String	ASCII (8)	'TM_GROUP'
OBJECT	Start of OM group	Fixed String	ASCII (8)	'OM_GROUP'
SCALE_FACTOR_AT_CENTE R_OF_PROJECTION	The scale factor at center of projection for OM projection	32-bit integer	ASCII (9)	0.0 to 2.0
LATITUDE_OF_PROJECTION _ORIGIN	The latitude of projection origin for OM projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
FALSE_EASTING	False easting for OM projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
FALSE _NORTHING	False northing for OM projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
OM_TYPE	Indicates the type of OM projection for the product	Fixed String	ASCII (1)	'A' or 'B'
END_OBJECT	End of OM group	Fixed String	ASCII (8)	'OM_GROUP'
OBJECT	Start of OMA group	Fixed String	ASCII (9)	'OMA_GROUP'
LONGITUDE_FIRST_POINT_G EODETIC	The longitude of first point defining central geodetic line of projection for OMA projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
LATITUDE_FIRST_POINT_GE ODETIC	The latitude of first point defining central geodetic line of projection for OMA projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
LONGITUDE_SECOND_POIN T_GEODETIC	The longitude of second point defining central geodetic line of projection for OMA projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
LATITUDE_SECOND_POINT_ GEODETIC	The latitude of second point defining central geodetic line of projection for OMA projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
END_OBJECT	End of OMA group	Fixed String	ASCII (9)	'OMA_GROUP'
OBJECT	Start of OMB group	Fixed String	ASCII (9)	'OMB_GROUP'

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Table 4-2. URF PVL Parameters (4 of 4)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ANGLE_OF_AZIMUTH	Angle of azimuth east of north for central line of projection for OMB projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
LONGITUDE_ALONG_PROJE CTION	Longitude of point alsong central line of projection at which angle of azimuth is measured for OMB projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
END_OBJECT	End of OMB group	Fixed String	ASCII (9)	'OMB_GROUP'
OBJECT	Start of PC group	Fixed String	ASCII (8)	'PC_GROUP'
LONGITUDE_OF_CENTRAL_ MERIDIAN	The longitude of central meridian for PC projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
LATITUDE_OF_PROJECTION _ORIGIN	The latitude of projection origin for PC projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
FALSE_EASTING	False easting for PC projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
FALSE _NORTHING	False northing for PC projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
END_OBJECT	End of PC group	Fixed String	ASCII (8)	'PC_GROUP'
OBJECT	Start of PS group	Fixed String	ASCII (8)	'PS_GROUP'
VERTICAL_LONGITUDE_FRO M_POLE	The vertical longitude from pole for PS projection	32-bit integer	ASCII (12)	-180.0 to +180.0 degrees
STANDARD_PARALLEL	The standard parallel for PS projection	32-bit integer	ASCII (11)	-90.0 to +90.0 degrees
SCALE_FACTOR_AT_PROJE CTION_ORIGIN	The scale factor at the projection origin for PS projection	32-bit integer	ASCII (9)	0.0 to 2.0
FALSE_EASTING	False easting for PS projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
FALSE _NORTHING	False northing for PS projection	32-bit integer	ASCII (16)	$-1.0*10^4$ to $1.0*10^4$ meters
END_OBJECT	End of PS group	Fixed String	ASCII (8)	'PS_GROUP'

Table 4-3. File Naming Convention For URF

Field	Description	Format/ Type Max Size (Bytes)	Value
Originating System	Originating System in URF	ASCII String (20)	Originating System in URF
URF Creation Date	Date when URF was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for URF filename	ASCII String (3)	'URF'

EXAMPLE ONLY   **EXAMPLE ONLY**

      FILENAME = ORIGINATING_SYSTEM.yyyymmddhhmmss.URF,
where

      ORIGINATING_SYSTEM = value of originating system provided in URF
and

      yyyymmddhhmmss = URF creation date= 20010719123845

Figure 4-4. Example URF File Naming Convention

4.3.1.4 URF Acknowledgment (URFA)

After the URF has been read and validated by the LPGS, the LPGS automatically pushes a URF Acknowledgment (URFA), via ftp "put", to the supplier system (i.e., ECS). The URFA announces either the successful completion of URF transfer/validation, or identifies any errors or problems that have been encountered. Using the file naming convention depicted in Table 4-3 (an example is provided in Figure 4-5), unique file names (time-based) are assigned to each URFA. The URFA consists of PVL statements as depicted in Table 4-5 . A URFA PVL example is provided in Figure 4-6.

Table 4-4. File Naming Convention For URFA

Field	Description	Format/ Type Max Size (Bytes)	Value
Originating System	Originating System in URF	ASCII String (20)	Originating System in URF
URF Creation Date	Date when URF was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for URFA filename	ASCII String (4)	'URFA '

EXAMPLE ONLY   **EXAMPLE ONLY**

  FILENAME = ORIGINATING_SYSTEM.yyyymmddhhmmss.URFA ,

where

  ORIGINATING_SYSTEM = value of originating system provided in URF

and

  yyyymmddhhmmss = URF creation date = 20010719123845

Figure 4-5. Example URFA File Naming Convention

Table 4-5. URFA PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	URFACK
REQUEST_ID	Request ID defined in PDR	Variable String/ASCII (20)	Unique ID. Set equal to Request ID defined in the URF.
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "MISSING USER REQUEST PARAMETER" "INVALID OR MISSING REQUEST ID" "MISSING L0R POINTER" "FTP FAILURE" "LPGS INTERNAL ERROR"
TIME_STAMP	Not Used.	ASCII (20)	Null

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

REQUEST_ID = URF1234;
MESSAGE_TYPE = URFA ;
DISPOSITION = "INVALID GRANULE ID";
TIME_STAMP = 1999-06-23T09:46:35Z;

Figure 4-6. Example URFA PVL

4.3.1.5 Authentication Request

Authentication is performed for the establishment of each TCP session. Table 4-6 provides the format and content of the Authentication Request. The Authentication Request is an application process-to-application process message sent using TCP. An Authentication Request is the first message sent by the originator of the TCP session prior to transmission of any other data transfer message. It is used to validate the TCP session by verifying the originator's access. Both LPGS and ECS use this message as needed to establish a connection between the ECS gateway and an LPGS processor.

If the Authentication Request is rejected (as denoted by the Authentication Response), the TCP connection is broken. An Authentication Request fails if one or more of the following conditions are true:

a.   Message Type is not set to appropriate value.

Table 4-6. Authentication Request Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Authentication Request	Unsigned Integer (1 B)	15
Message Length	Length of Message in Bytes (non-zero integer)	Unsigned Integer (3 B)	Determined Message Length
Destination System ID	Communications Server	ASCII String (< 20 B)	Processor ID
Origination System ID	Communications Client	ASCII String (< 20 B)	Processor ID
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
User ID	User-provided identification; assigned by Destination system	ASCII (< 20 B)	User ID
Password	Authentication parameter - password assigned to User by Destination System	ASCII (< 20 B)	Password

b. Message Length does not contain a value equal to the number of bytes of application data read in for the transmission.

c. Destination System does not equal the correct string used to identify ECS or LPGS

d. Origination does not equal the correct string used to identify LPGS or ECS.

e. User ID and/or Password (for Origination System) are not the values expected for LPGS or ECS.

4.3.1.6 Authentication Response

After the Destination System performs an authentication check on the Origination System, it returns an Authentication Response, which is the handshake message used to complete the authentication process. This message is also an application process-to-application process message sent using TCP. The Authentication Response is used to relate the results of the TCP session validation process. If the Origination System attempts to transmit another message prior to authentication completion, or the Authentication Request is rejected for one of the reasons listed in 4.2.3, then an Authentication Response message is returned with a disposition value '2'. Table 4-7 provides the format and content of the Authentication Response.

Table 4-7. Authentication Response Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Authentication Response	Unsigned Integer (1 B)	16
Message Length	Length of Message in Bytes (non-zero integer)	Unsigned Integer (3 B)	Determined Message Length
Destination System ID	Communications Server	ASCII String (< 20 B)	Copied from Corresponding Authentication Request
Origination System ID	Communications Client	ASCII String (< 20 B)	Copied from Corresponding Authentication Request
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
Authentication Disposition	Result of authentication	Integer (1B)	1 - accepted 2 - rejected

4.3.1.7 Acquire Request (AR)

The Acquire Request (AR) message is used by LPGS to order products from ECS that are currently in the archive, to support of LPGS product reprocessing. Table 4-8 defines the contents and format of the Acquire Request message header and PVL. The DESTINATION_USER parameter in the PVL indicates where the DAN will be sent, and therefore who will receive the data being requested. Since LPGS is to receive the data, the DESTINATION_USER parameter is set to the LPGS processor ID to which ECS will send the

Table 4-8. Acquire Request

HEADER

Field	Description	Type (Length in Bytes)	Value
Message Type	Indicates Acquire Request	Unsigned Integer (1)	30
Message Length	Length of Message in bytes	Unsigned Integer (3)	Determined length > 265

PVL

Parameter	Description	Type /Format (Max Length in Bytes)	Valid Values
ORIGINATING_SYSTEM	Originator of acquire request	Variable String / ASCII (20)	LPGS Processor ID e.g., 'LPGS1' (Note 1)
DESTINATION_USER	LPGS Processor ID to which ECS sends DAN	Variable String / ASCII (20)	LPGS Processor ID
DR_SEQ_NO	Sequence number assigned by LPGS	Unsigned 32-bit Integer / ASCII (10)	$\leq 4.295*10^9$
DELIVERY_TYPE	Type of delivery to use	Variable String / ASCII (10)	'ftp_pull'
MEDIA_TYPE	not used	Fixed Variable String / ASCII (10)	not used
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID

Note 1: Each LPGS processor ID must be registered as an ECS user.

DAN handshake control message (via ftp "put"). The DELIVERY_TYPE parameter indicates that the delivery will occur via ftp. Data are requested, in a single Acquire Request by the UR and scan line information.

It is important to point out that LPGS may invoke the Acquire Request, ordering L0R data from ECS, at any time---not only in direct response to an active product generation request (URF request). This capability is used to automate performance analysis in support of anomaly resolution, and in responding to trouble tickets. In the event that LPGS needs to reprocess Level 1 R/G products in response to a trouble ticket (i..e., re-filling an order/product request that has already been provided to a user), this process will be manually coordinated via User Services, and ECS/LPGS operators.

4.3.1.8 Acquire Request Acknowledgment (ARA)

ECS sends a Acquire Request Acknowledgment (ARA) in response to a Acquire Request (AR). The ARA message notifies LPGS that either the AR has been received, properly parsed, and queued by the ECS data server or is incorrectly formulated and has been rejected. It also provides LPGS with a unique ID, for future use in product statusing, cancellation of acquire requests, and/or correlating with the DAN received from ECS upon staging for retrieval. Table 4-9 defines the content and format of the ARA header and PVL. The ARA reports a disposition which rejects the Acquire Request if the Acquire Request is formulated incorrectly (i.e., the required parameters are not present for either a FILE_ GROUP object or a SEARCH_GROUP object), or if there was a network error.

Table 4-9. Acquire Request Acknowledgment

HEADER

Field	Description	Type (Length in Bytes)	Value
Message Type	Acquire Request Acknowledgment	Unsigned Integer (1)	31
Message Length	Length of Message in Bytes	Unsigned Integer (3)	≤ 119
Disposition	One of the following: Successful Validation failure Network error	Integer (1)	 0 1 2

PVL

Field	Description	Type /Format (Max Length in Bytes)	Value
ECS_ID	Not Used	Variable String / ASCII (20)	Not Used
ORIGINATING_SYSTEM	Originator of Acquire Request	Variable String / ASCII (20)	LPGS Processor ID from Acquire Request
DESTINATION_USER	LPGS processor ID DAN destination (final data destination)	Variable String / ASCII (64)	DESTINATION_USER in Acquire Request
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
DR_SEQ_NO	Associated Acquire Request Sequence Number	Unsigned 32-bit Integer / ASCII (10)	≤ 4.295*10^9

4.3.1.9 Close Session Message

The LPGS will send a close session message to the ECS Gateway as a means of notifying the ECS Gateway of its intent to terminate a TCP/IP socket connection. The format and content of the close session message is defined in Table 4-10.

Table 4-10. Close Session Message

Field	Description	Type (Length in Bytes)	Value
Message Type	Type of Message (Gateway Control Message)	Integer (1)	0
Message Length	Length of Message in Bytes	Integer (3)	76
Enumerated Type	Type of Gateway Control Message (Close Session = 2)	Integer (4)	2
Socket Notification Flag	Indicates whether ECS gateway socket interface should be notified of closure of session 1 is true; 0 is false	Integer (4)	0 or 1
ECS Internal Server Notification Flag	Indicates whether ECS internal server should be notified (with same message) of session closure; 1 is true; 0 is false	Integer (4)	0 or 1 (usually 1 for LPGS)
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID

4.3.1.10 Data Availability Notice (DAN)

The Data Availability Notice (DAN) is a control message that supports data transfer. A DAN message is sent by the system supplying the data (i.e., ECS) to the system that ingests the data (LPGS). An ECS DAN announces the availability of one or more Landsat 7 Level 0R file groups for transfer. The ECS DAN serves as the stimulus for automated network transfer and ingest of those data. The DAN(s) should not be sent until the ECS processor is ready to support the next pull.

ECS operator tunable parameters for the ECS DAN include number of transmission attempts and the time between attempts. When the set number of attempts has been performed without success, operator intervention is required.

The DAN identifies the total file count, the data type, individual file names, types, sizes and directory names. The maximum message length allowed for a DAN is 1 Mbyte (1,048,576 bytes). Each DAN includes a Message Header, Exchange Data Unit (EDU) Label, a DAN Label, and Parameter Value Language (PVL) statements. Format and contents for the DAN Message Header and Labels are defined in Table 4-11. LPGS does not use the information in the EDU and DAN Labels for L0R data ingest. These labels are maintained in the structure for

consistency with the Landsat-7 Processing System (LPS) software design and the ECS-LPS interface.

DAN PVL Parameters are defined in Table 4-12. DAN PVL Statements are ASCII strings, having at most 512 characters, in the form of: "PARAMETER = Value;". The Value strings may be predefined values, ASCII numeric strings, ISO time strings, or arbitrary strings. If the Value field contains spaces or a semicolon, it must be enclosed in double quotes. There may be white space before, after, or between items of each element, where items are parameter names, parameter values, or "=", with the following exceptions: (i) comments must be placed at the beginning of each line or following the ";", and (ii) no white space may be placed immediately preceding the ";". If white space characters are contained within quotation marks in an ASCII string of the value field, (e.g., blanks in a file name) they will not be removed. This white space may be blank(s), a carriage return, or linefeed, tab, or comment Comments are enclosed in delimiters as follows: /*...comment...*/. The semicolon at the end of each statement serves as the field delimiter. PVL statements may occupy multiple lines. The PVL code details can be found in the document PVLSPEC - Parameter Value Language Specification (CCSDS 641.0-B-1). A PVL tutorial is also available in CCSDS 641.0-G-1.

The values shown in Table 4-12 includes pre-defined values enclosed within single quote marks and processor determined values. The maximum size identified for a DAN parameter applies only to the value within a PVL statement. If any parameter value includes white space characters, it must be enclosed in double quote marks within the ASCII string. Processor determined values include ASCII alphanumerics, ASCII numerics, and ISO times to be filled in with appropriate values by an ECS processor during DAN creation.

Table 4-11. DAN Message Header and Labels (1 of 2)

Message Header (4 Bytes)

Field	Description	Type (Length in Bytes)	Value
Message Type	DAN Indicator	Unsigned Integer (1B)	1 - Indicates DAN
Message Length	Length of Message in bytes	Unsigned Integer (3B)	Length of Message

Exchange Data Unit (EDU) Label (20 Bytes)

Field	Description	Type (Length in Bytes)	Value
Control Authority ID	Not used	ASCII (4 B)	Not used*
Version ID	Not used	ASCII (1 B)	Not used*
Class ID	Not used	ASCII (1 B)	Not used*
S1	Not used	ASCII (1 B)	Not used*
S2	Not used	ASCII (1 B)	Not used*
Data Description	Not used	ASCII (4 B)	Not used*
Delimitation Parameter	Not used	ASCII (8 B)	Not used*

* Note: ECS does not care what is in this field.

Table 4-11. DAN Message Header and Labels (2 of 2)

DAN Label (20 Bytes)

Field	Description	Type (Length in Bytes)	Value
Control Authority ID	Not used	ASCII (4 B)	Not used*
Version ID	Not used	ASCII (1 B)	Not used*
Class ID	Not used	ASCII (1 B)	Not used*
S1	Not used	ASCII (1 B)	Not used*
S2	Not used	ASCII (1 B)	Not used*
Data Description	Not used	ASCII (4 B)	Not used*
Delimitation Parameter	Not used	ASCII (8 B)	Not used*

* Note: ECS does not care what is in this field.

Table 4-12. DAN PVL Parameters (1 of 2)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of DAN	Variable String	ASCII 20B	ECS Processor Identifier (Note 1)
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII 4B	1 - 9999
EXPIRATION_TIME	ISO date and time that data can be deleted from originating system. This time is set by the EDC DAAC based on available resources	Fixed String	ASCII 20B	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T and Z are literals
OBJECT	Start of file group parameters (repeat for each group of files). (Note 2)	Fixed String	ASCII 10B	'FILE_GROUP'
DATA_TYPE	ECS Data Type (Note 3)	Variable String	ASCII 20B	'L70R'
NODE_NAME	Name of network node on which the file group resides	Variable String	ASCII 64B	e.g., L0R.EDC.nasa.gov
REQUEST_ID	Request ID defined in the Acquire Request.	Variable String	ASCII 10B	Request ID (unique ID) defined in the Acquire Request.
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII 9B	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e., path name)	Variable String	ASCII (Note 4)	e.g., /ECS/SUB1

Note 1. Each processor must have a unique identifier.

Note 2. ECS file group contains all files related to a single subinterval format-specific data set.

Note 3. Each DATA_TYPE must be unique within a FILE_GROUP---LPGS does not validate this.

Note 4 Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID. See example DAN, Figure 4-7.

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Table 4-12. DAN PVL Parameters (2 of 2)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
FILE_ID	File name	Variable String	ASCII (Note 5)	L0R file name
FILE_TYPE	File Data Type	Variable String	ASCII 20B	'IMAGE1', IMAGE2', IMAGE3', 'IMAGE4', 'IMAGE5', 'IMAGE6HI', 'IMAGE6LO', 'IMAGE7', 'IMAGE8' 'IC', 'CPF', 'LPS-METADATA', 'ECS- METADATA', 'MSCD', or 'PCD'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII 10B	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII 9B	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII 10B	'FILE_GROUP'

Note 5. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID. See example DAN, Figure 4-7.

DANs are validated to check that all required fields contain valid values and that the format of the message is correct and consistent with the standards. DANs that adhere to the defined message standards shown in Table 4-12   are accepted and processed. An example ECS DAN PVL is provided in Figure 4-7. Values that are followed by empty comment holders (/* */) have been arbitrarily created for the sake of example.

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

If the DAN is reported to have any errors, as reported by LPGS in the DAA, the DAN is not processed. LPGS does not process any of the file groups in the DAN. For DAN file groups with errors, ECS must correct the files/file information accordingly and retransmit the corrected file group(s) under a new DAN. LPGS sends a separate DAA to ECS indicating the disposition of each DAN.

```
ORIGINATING_SYSTEM = ECS_3;
DAN_SEQ_NO = 5326; /* */
TOTAL_FILE_COUNT = 42;
EXPIRATION_TIME = 1998-11-09T20:00:00Z;
OBJECT = FILE_GROUP;
        DATA_TYPE = L70R;
        DESCRIPTOR = SubXYZQ; /* */
        NODE_NAME = L7XLSRV.GSFC.NASA.GOV; /* */
        REQUEST_ID = URF1234;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = /*ECS3 Directory Branch to File*/;
                FILE_ID = L71EDC139831218020.B10;
                FILE_TYPE = IMAGE1;
                FILE_SIZE = 242120;
        END_OBJECT = FILE_SPEC;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = /*ECS3 Directory Branch to File*/;
                FILE_ID = L71EDC139831218020.B20;
                FILE_TYPE = IMAGE2;
                FILE_SIZE = 242120;
        END_OBJECT = FILE_SPEC;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = /*ECS3 Directory Branch to File*/;
                FILE_ID = L71EDC139831218020.MTA;
                FILE_TYPE = METADATA;
                FILE_SIZE = 67561;
        END_OBJECT = FILE_SPEC;
        /*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
        /* Repeat FILE_SPEC objects for each Level 0R data file within file group*/
        /*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = /*ECS3 Directory Branch to File*/;
                FILE_ID = L71EDC139831218020.R12;
                FILE_TYPE = BROWSE;
                FILE_SIZE = 1667561;
        END_OBJECT = FILE_SPEC;
END_OBJECT = FILE_GROUP;
```

Figure 4-7. Example DAN PVL for Level 0R Data Files

4.3.1.11 Data Availability Acknowledgment (DAA)

A Data Availability Acknowledgment (DAA) message is the corresponding handshake/control message for the DAN. LPGS sends a DAA in response to each ECS DAN received. The DAA acknowledges receipt of the DAN and provides the mechanism to identify the status of data transfer scheduling and any DAN errors. One or more negative disposition bits in a short DAA

means the entire DAN has been rejected. Its information must be corrected and resubmitted under a new DAN. Since the ECS does not expect the LPGS to "get" any file groups in a failed DAN, a DDN sent for a failed DAN will be treated as an error.

The short form of the DAA shown in Table 4-13 is used primarily to respond to error-free DANs, DANs with message header errors and errors in DAN PVL that are not attributable to specific file groups. An example of a short DAA message definition is depicted in Table 4-14. The long form of the DAA message shown in Table 4-15 is used when one or more file groups in the DAN have associated errors. An example long DAA message definition is depicted in Table 4-16.

Table 4-13. Short DAA Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Short Data Availability Acknowledgment	2
Message Length	Unsigned Integer (3B)	Length of Message in Bytes	13
REQUEST_ID	Variable String / ASCII (20)	Request ID contained in the User Request File (URF)	unique ID
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Disposition	Logical Bits (4B)	Disposition Bits - - meaning: accepted not used invalid DAN Sequence Number not used not used not used invalid file count not used ECS internal error not used not used invalid DAN length not used database failures duplicate DAN sequence number not used spares invalid PVL statement missing or invalid originating system data provider request threshold exceeded data provider volume threshold exceeded system request threshold exceeded system volume threshold exceeded	Bit location set to 1: none 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15-25 26 27 28 - 29 - 30 31
Transfer Start Time	Integer (1B)	Not Used	not used

Table 4-14. Example Short DAA Message Definition

Message Type	2
Message Length	13
Request ID	URF1234
DAN Sequence No.	1
Disposition	00000000000000000000000000000000* (accepted)
Transfer Start Time	

* Logical bits

Table 4-15. Long DAA Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Long Data Availability Acknowledgment	3
Message Length	Unsigned Integer (3B)	Length of Message In Bytes	Input length of message in bytes
REQUEST_ID	Variable String / ASCII (20)	Request ID contained in the User Request File (URF)	unique ID
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Number of File Groups (to follow)	Integer (4B)	Number of File Groups with Errors	Input file group count

For each file group having errors in the Data Availability Notice

Data Type PVL	ASCII String (<20B)	ECS Data Type	Supplied in DAN
Descriptor PVL	ASCII String (<60B)	Name of instrument/sensor that collected the data	Supplied in DAN
Disposition	Logical Bits (2B)	Disposition bits - meaning:	Bit location set to 1:
			- - -
		not used	0
		invalid data type*	1
		not used	2
		descriptor missing	3
		invalid directory*	4
		not used	5
		not used	6
		not used	7
		invalid file size field	8
		not used	9
		not used	10
		invalid file ID*	11
		not used	12
		spare	13
		invalid node name*	14
		invalid file type*	15

Table 4-16. Example Long DAA Message Definition

Message Type	3
Message Length	36
Request ID	URF1234
DAN Sequence No.	1
Number of File Groups (to follow)	2
Data Type PVL	L70RF1
Descriptor PVL	SubXYZQ
Disposition	01000000000000000000000000000000* (invalid DAN sequence number)
Data Type PVL	L70RF2
Descriptor PVL	SubXYZQ
Disposition	00000000000000000000000000000000* (accepted)

* Logical bits

4.3.1.12 L0R Data ftp Pull

After receiving a valid DAN from ECS, LPGS pulls the L0R data files that have been staged on ECS disk space. All such file transfers are conducted through the use of Standard File Transfer Protocol (ftp), as described in RFC 959 (see 4.2.2), an Internet standard for file transfers that supports retrieval of files from a remote server, with security provided by a User ID and password. Upon receipt of the L0R data, LPGS performs the requisite L1 processing.

4.3.1.13 Data Delivery Notice (DDN)

A Data Delivery Notice (DDN) is an electronic message sent announcing the status of data transfer and archival. Each DDN corresponds to a single DAN. A DDN is sent by LPGS after the retrieval and archival of transferred L0R file groups listed in the ECS DAN.   The DDN announces the completion of file transfer preprocessing, and archival, and identifies the success or reason of failure for each file.

The short DDN is used for error-free data transfers and errors relating to all file groups, e.g. communication related errors. If all files related to a DAN do not have the same disposition, the long form of this message is used. The long DDN identifies the disposition of every file in a particular DAN. This includes files transferred successfully, files for which there were transfer problems, and files for which there are ingest problems (e.g., metadata checking related errors).

Format and contents for the short and long DDNs are shown in Tables 4-17 and 4-19 respectively.   Examples of the short and long DDN message definitions are depicted, respectively, in Tables 4-18 and 4-20. Note that the Data Retrieval Response (DRR) Sequence Number is not used; DRRs apply to a 'Put' interface, which is not used for ECS-LPGS file transfers. LPGS sends a DDN in response to each received DAN. Each DDN is sent to the ECS processor from which LPGS received the corresponding DAN. LPGS receives a DDA response from each ECS processor acknowledging receipt of each DDN prior to TCP session termination.

Table 4-17. Short DDN Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Short Data Delivery Notice	11
Message Length	Unsigned Integer (3B)	Length of Message in Bytes	40
Request ID	Variable String / ASCII (20)	Request ID contained in the User Request File (URF)	unique ID
DRR Sequence No.	Integer (4 B)	Not used	0
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Disposition	Integer (1B)	One of the following: Successful Network Failure Unable to Establish FTP Connection Not used All File Groups/Files not Found FTP failure Post-transfer file size check failure FTP Command Failure Spares Duplicate file name in granule Metadata Preprocessing error Resource Allocation Failure Ingest S/W Internal Error Data base Access Error Incorrect Number of Metadata Files Incorrect Number of Science Files Incorrect Number of Files Data Conversion Failure Request Cancelled Unknown Data Type Invalid or Missing File Type File I/O Error Data Archive Error	- 0 1 2 3 4 5 6 7 8 - 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255
Spares	(3 B)		
Time Stamp	ASCII (20 B)	ISO Time when Destination System transferred the last part of the data (all files)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T and Z are literals
Throughput	Integer (4 B)	Rate in bytes per second averaged over all files	> 0 ('0' indicates unsuccessful transfer)

Table 4-18. Example Short DDN Message Definition

Message Type	11
Message Length	40
Request IDD	URF1234
DRR Sequence No.	0
DAN Sequence No.	1
Disposition	0 (Successful)
Spares	
Time Stamp	1999-09-27T11:49:38Z
Throughput	10000

Table 4-19. Long DDN Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Long Data Delivery Notice	12
Message Length	Unsigned Integer (3B)	Length of Message	Input length of message in bytes
REQUEST_ID	Variable String / ASCII (20)	Request ID contained in the User Request File (URF)	unique ID
DRR Sequence No.	Integer (4 B)	Not used	0
DAN Sequence No.	Unsigned Integer (4B)	Sequence no. assigned by Originating System	Supplied in DAN
Number of Files	Integer (4 B)	Total File Count in DAN	Supplied in DAN

For each File in the Data Availability Notice

Field	Type (Length in Bytes)	Description	Value
File Directory	ASCII (equivalent to DAN Length)	Variable ASCII string specifying file directory location	Supplied in DAN
File Name	ASCII (equivalent to DAN Length)	File name in ASCII string	Supplied in DAN
File Transfer Disposition	Integer (1B)	One of the following: Successful Network Failure Unable to Establish FTP Connection Not used All File Groups/Files not Found FTP failure Post-transfer file size check failure FTP Command Failure Spares Duplicate file name in granule Metadata Preprocessing error Resource Allocation Failure Ingest S/W Internal Error Data base Access Error Incorrect Number of Metadata Files Incorrect Number of Science Files Incorrect Number of Files Data Conversion Failure Request Cancelled Unknown Data Type Invalid or Missing File Type File I/O Error Data Archive Error	 0 1 2 3 4 5 6 7 8 - 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255
Time Stamp	ASCII (20B)	ISO Time when Destination System transferred the last part of the data	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T and Z are literals
Throughput	Integer (4B)	Rate in bytes per second for each file identified	> 0 ('0' indicates unsuccessful transfer)

Table 4-20. Example Long DDN Message Definition

Message Type	12
Message Length	20041
Request ID	URF1234
DRR Sequence No.	0
DAN Sequence No.	1
Number of Files	2
File Directory	LPGS3
File Name	L71EDC139831218020.B10
File Transfer Disposition	1 (Network Failure)
Time Stamp	1999-09-27T11:49:38Z
Throughput	0 (unsuccessful transfer)
File Directory	LPGS3
File Name	L71EDC139831218020.MTA
File Transfer Disposition	5 (FTP Failure)
Time Stamp	1999-09-27T11:49:38Z
Throughput	0 (unsuccessful transfer)

If the DAN is reported to have errors as reported by LPGS in the DDN, LPGS processes only those file groups without errors. For DAN file groups with errors, ECS must correct the files/file information accordingly and retransmit the corrected file groups under a new DAN. File groups that were successfully transferred/archived should not be included in the revised DAN.

ECS operator tunable parameters for the LPGS DDN include number of transmission attempts and the time between attempts. When the set number of attempts has been performed without success, operator intervention is required.

4.3.1.14   Data Delivery Acknowledgment (DDA)

A Data Delivery Acknowledgment (DDA) is the corresponding handshake/control message for the DDN. The DDA provides the mechanism for ECS to acknowledge receipt of the DDN. The DDA is shown in Table 4-21. The DDA disposition is always set to "0" by ECS.

Table 4-21. DDA Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Data Delivery Acknowledgment	Unsigned Integer (1B)	17
Message Length	Length of Message in Bytes	Unsigned Integer (3B)	33
Request ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
DRR Sequence No.	Not used	Integer (4 B)	0
DAN Sequence No.	Sequence number assigned by Originating System	Unsigned Integer (4B)	Supplied in DAN
Disposition	DDN Received Spare	Integer (1 B)	0 1- 255
Time Stamp	ISO Time when Destination System transferred the last part of the data	ASCII (20 B)	Null (Note 1)

Note 1: A single '\0' is sufficient to null the string out.

4.3.2 Data Exchange of Level 1 R/G From LPGS to ECS

Level 1 R/G files, described in Section 5.2, are transferred from LPGS to ECS using the polling ingest with Product Delivery Record (PDR) process, as defined in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. The transfer process uses ftp (4.2.2).

4.3.2.1 Polling Ingest With Product Delivery Record

The purpose of the ECS/LPGS electronic interface is to support the delivery of the Level 1 R/G data product files from the LPGS to ECS at the EDC DAAC for distribution to the user. A Polling Ingest with Product Delivery Record mechanism is employed for the purpose of transferring the Level 1 R/G data product files to ECS. To accommodate this interface, a single server will be identified on the LPGS side of the interface; the Level 1 R/G data product files and the Product Delivery Records (PDRs) will be placed on this PDR Server by the LPGS. Upon receipt of a 'SUCCESSFUL' PAN, the LPGS will clean the Server disk of the PDR and data product files. This implementation of the Polling Ingest with PDR consists of the following steps (see Figure 4-8):
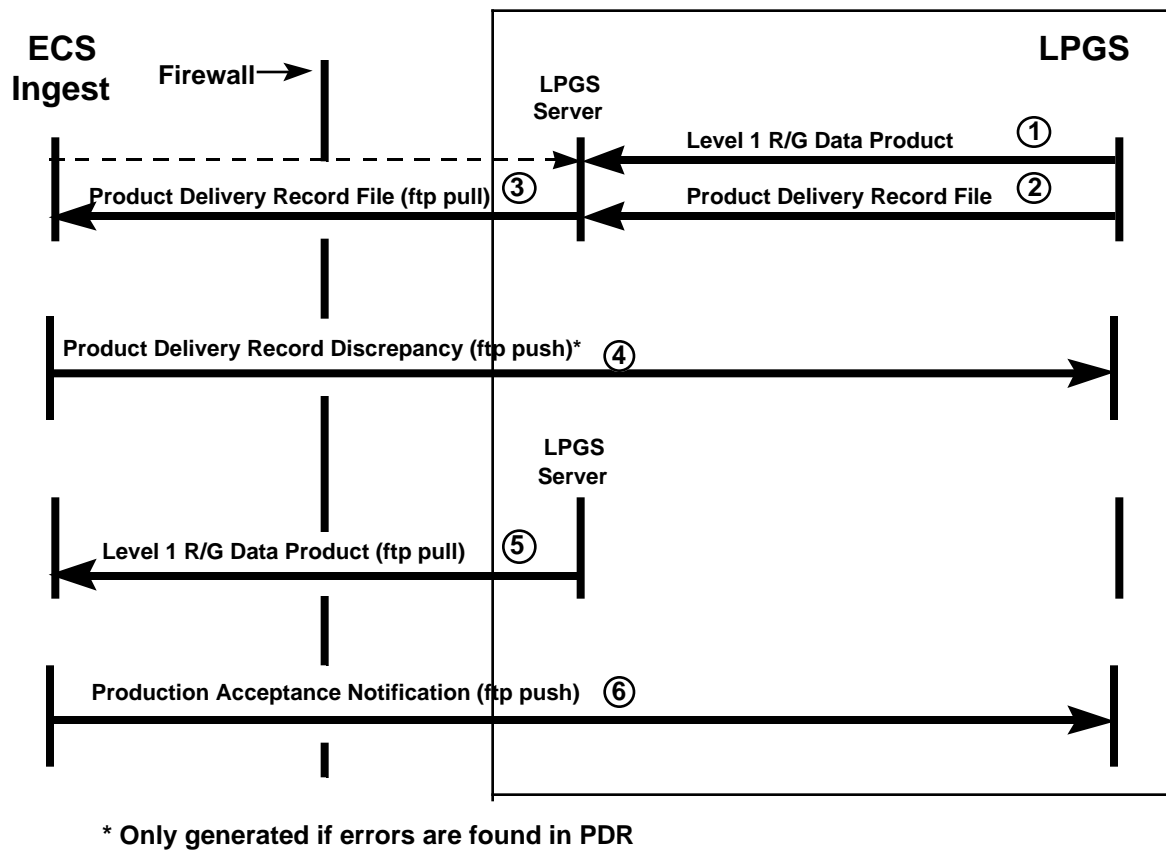
1. The LPGS places the Level 1 R/G data product files on the PDR Server in a specified location -

2. The LPGS generates a PDR; places the PDR on the Server in a known directory -

3. With operator tunable periodicity, ECS polls the directory on the PDR Server , and detects/ retrieves the PDR -

   The ECS side of the interface is equipped with an ftp daemon---a computer program which automatically, and with operator-tunable periodicity, polls the PDR Server , detects a PDR file via a ftp "-ls" command, and acquires the PDR file information via an ftp "get" command (note: see section 4.3.4 for security aspects). At the PDR Server, an ftp daemon continually listens for incoming ftp requests, acts on each arriving ftp request, and routes each ftp request to the appropriate account, making the directory sub-tree available to ECS with the allowable privileges.

4. ECS sends Product Delivery Record Discrepancy (PDRD) to the LPGS (via ftp "put") indicating error/success dispositions for file groups in the PDR -

   Once a PDR has been detected/acquired by ECS, the PDR is validated. In the event that the PDR is invalid, ECS automatically returns a Product Delivery Record Discrepancy (PDRD), via ftp "put" , to the supplier system (i.e., the LPGS), indicating the error/success dispositions for file groups in the PDR resulting from ECS's attempt to validate the PDR. If the PDR is valid, ECS schedules to pull the Level 1 R/G data files using an ftp "get" command; in this case no PDRD is sent. If an error is detected in the PDR, processing is terminated and none of its files is transferred to the ECS server for processing until a corrected PDR is received and successfully processed.

5. ECS pulls the Level 1 R/G data files from the PDR Server to be ingested. The Level 1 R/G data files are then stored for subsequent distribution.

```
ECS                Firewall ───→                                                      LPGS
Ingest                              LPGS
                                    Server
                                                    Level 1 R/G Data Product      ①

        Product Delivery Record File (ftp pull) ③   Product Delivery Record File  ②


        Product Delivery Record Discrepancy (ftp push)*  ④


                                    LPGS
                                    Server

           Level 1 R/G Data Product (ftp pull)  ⑤


        Production Acceptance Notification (ftp push)  ⑥
```

* Only generated if errors are found in PDR

Figure 4-8. ECS-LPGS Level 1 R/G Product Data File Transfer Mechanism

6. ECS sends a Production Acceptance Notification (PAN) to the LPGS (via ftp "put") indicating either success or errors found.

Operator tunable parameters for the Polling Ingest with PDR data transfer mechanism include ECS periodicity for polling the ECS open server for the PDR. All relevant operator tunable parameters will be identified in an operations agreement.

The Polling Ingest with PDR transfer mechanism is fully automated. In the context of this transfer mechanism, this section addresses the PDR, PDRD and PAN. In addition, the error conditions, error handling/backup methods, and physical media are discussed herein.

4.3.2.2 Level 1 R/G Product Delivery Record (PDR)

The purpose of the LPGS PDR is to announce the availability of a Level 1 R/G Product File for transfer, including file names, file size, location, etc. The LPGS PDR is generated and placed in a pre-specified directory on the LPGS Server by the system supplying the data (i.e., the LPGS) after the data files referenced in the LPGS PDR have been placed into their respective directories. Both the server and the directory are operator configurable parameters. ECS polls the LPGS Server, detects/acquires/validates the LPGS PDR, and schedules to pull the data.

The LPGS PDR format is comprised of Parameter-Value Language (PVL) Statements. The required LPGS PDR PVL parameters are depicted in Table 4-22 . The LPGS PDR PVL statements are ASCII strings, having at most 256 characters, in the form: "Parameter = Value." The Value strings shown in Table 4-22 include pre-defined values shown by single quote marks and processor determined values which include ASCII strings, International Standards Organization (ISO) times, and integers to be filled in with appropriate values by an processor during LPGS PDR creation. An example LPGS PDR PVL for a Level 1 R/G Product File is provided in Figure 4-9. The maximum allowed message length for an LPGS PDR is 1 megabyte. LPGS PDRs are validated to check that all required fields contain valid values and that the format of the LPGS PDR is correct and consistent with the standards. LPGS PDRs that adhere to the defined message standards shown in Table 4-22 are accepted and processed. Additional information on PVL valid characters can be found in the document entitled, "Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book." Using the file naming convention depicted in Table 4-23 , unique file names (time-based) are assigned to each LPGS PDR, so as to avoid potential overwrites (an example LPGS PDR File Naming Convention is depicted in Figure 4-10).

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

4.3.2.3 Product Delivery Record Discrepancy (PDRD)

The Product Delivery Record Discrepancy (PDRD) is sent by ECS to the supplier system (i.e., LPGS), via automatic ftp "put" , only in the event that the LPGS PDR cannot be successfully validated. The PDRD identifies the error/success dispositions for file groups in the LPGS PDR resulting from ECS's attempt to validate the LPGS PDR. Unique file names (time-based) are assigned to each PDRD using the same basic file name used for the PDR (the convention is depicted in Table 4-23 and an example is provided in Figure 4-10), except that the extension will be "PDRD." There are two forms of PDRD, including a short form (Table 4-24) and long form (Table 4-25). The short form is used for a PDR when the first error encountered in each file group within the LPGS PDR is the same or the first error found applies to each group. The long form is used when one or more file groups in the LPGS PDR have invalid parameters; some file groups may be error-free. For each file group, if an error is encountered, ECS halts processing and reports the error which it just encountered for that file group. All remaining conditions in

Table 4-22. PDR PVL Parameters

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of Delivery Record	Variable String	ASCII (20)	LPGS Processor Identifier
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII (4)	1 - 9999
EXPIRATION_TIME	ISO Time for data deletion from originating system. This time is set by LPGS based on available resources.	Fixed String	ASCII (20)	GMT in for the format: yyyy-mm-ddThh:mmssZ, where T indicates the start of time information and Z indicates "Zulu" time. (operations tunable amount of time after PDR sent)
REQUEST_ID	Request ID defined in the Acquire Request	Variable String	ASCII 20B	unique ID. Set equal to the Request ID defined in the Acquire Request message.
OBJECT	Start of file group parameters (repeat for each group of files).	Fixed String	ASCII (10)	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII (8)	'LPGS_L1R' or 'LPGS_L1G'
NODE_NAME	Name of network node on which the file resides	Variable String	ASCII (64)	e.g., 'L1R_Gsrv.nasa.gov'
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII (9)	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e., path name)	Variable String	ASCII (Note 1)	e.g., /LPGS1/L1R_G/
FILE_ID	File name	Variable String	ASCII (Note 2)	LPGS file name (per LPGS Data/Metadata File Definition)
FILE_TYPE	File Data Type	Variable String	ASCII (20)	'L1R' 'L1G'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII (10)	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII (9)	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII (10)	'FILE_GROUP'

Note1. Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID.
Note2. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID.

```
EXAMPLE ONLY                                              EXAMPLE ONLY

ORIGINATING_SYSTEM = LPGS1234;    /* EDP Processor Identifier */
TOTAL_FILE_COUNT = 2;
EXPIRATION_TIME = 1998-11-09t20:00:00Z;
REQUEST_ID = URF1234;
OBJECT = FILE_GROUP;
        DATA_TYPE = LPGS_L1R;   /* Allowed values pre-defined by ECS */
        NODE_NAME = L1R_GSRV.NASA.GOV;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = LPGS1/L1R_G;
                FILE_ID = (XXXX);      /* per LPGS file definition */;
                FILE_TYPE = METADATA;   /* Allowed values pre-defined by ECS */
                FILE_SIZE = 5000;
        END_OBJECT = FILE_SPEC;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = LPGS1/L1R_G/;
                FILE_ID = (XXXX);        /* per LPGS File definition */
                FILE_TYPE =  L1R;   /* Allowed values pre-defined by ECS */
                FILE_SIZE = 1000000;
        END_OBJECT = FILE_SPEC;
        ----------------------------------------------------------------------------------------
        /* Repeat FILE_SPEC objects for each EDC data file within file group */
        ----------------------------------------------------------------------------------------
END_OBJECT = FILE_GROUP;
        ----------------------------------------------------------------------------------------
        /* Repeat FILE_GROUP objects for each different file group */
        ----------------------------------------------------------------------------------------
```

Figure 4-9. Example PDR PVL

Table 4-23. File Naming Convention For PDR

Field	Description	Format/ Type Max Size (Bytes)	Value
Originating System	Originating System in PDR	ASCII String (20)	Originating System in LPGS PDR
LPGS PDR Creation Date	Date when LPGS PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file LPGS PDR filename	ASCII String (3)	'PDR'

Figure 4-10. Example PDR File Naming Convention

Table 4-24. Short PDRD PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Short Product Delivery Record Discrepancy	Fixed String/ASCII (9)	SHORTPDRD
REQUEST_ID	Request ID defined in PDR	Variable String/ASCII (20)	Unique ID. Set equal to the Request ID defined in the PDR.
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	"INVALID FILE COUNT" "ECS INTERNAL ERROR" "DATABASE FAILURES" "INVALID PVL STATEMENT" "MISSING OR INVALID ORIGINATING_SYSTEM PARAMETER" "DATA PROVIDER REQUEST THRESHOLD EXCEEDED" "DATA PROVIDER VOLUME THRESHOLD EXCEEDED" "SYSTEM REQUEST THRESHOLD EXCEEDED" "SYSTEM VOLUME THRESHOLD EXCEEDED"

Note 1. n any given instance, only one disposition value is provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value is followed by an EOL mark.

Table 4-25. Long PDRD PVL Parameters

Parameter2	Description	Type/Format (Length in Bytes)	Value2
MESSAGE_TYPE	Long Product Delivery Record Discrepancy	Fixed String/ASCII (8)	LONGPDRD
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
NO_FILE_GRPS to follow)	Number of File Groups with Errors	Integer/ASCII (4)	Number of File groups in PDR with errors

For each file group in the PDR

DATA_TYPE	ECS Data Type (Note 3)	ASCII String (20)	DATA_TYPE in PDR
DISPOSITION	Disposition of Ingest Request (Note 1) (Note 3)	Variable String/ASCII (64)	"SUCCESSFUL" "INVALID DATA TYPE" * "INVALID DIRECTORY" * "INVALID FILE SIZE" "INVALID FILE ID" * "INVALID NODE NAME" * "INVALID FILE TYPE" *

Note 1.   In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2.   Each parameter/value statement is followed by an EOL mark.

   * Null string check only

that file group are not validated. ECS processing then continues on with the next file group in the LPGS PDR. The dispositions in the Long PDRD will be reported for all file groups in the order listed in the PDR. In the event that a PDRD is returned to the LPGS, none of the files is transferred to the ECS for processing, and the LPGS must correct the errors and resubmit the entire LPGS PDR for processing. The PDRD consists of PVL Statements. Short and Long PDRD PVL examples are provided, respectively, in Figure 4-11 and Figure 4-12.

EXAMPLE ONLY   **EXAMPLE ONLY**

MESSAGE TYPE = SHORTPDRD;
REQUEST_ID = URF1234;
DISPOSITION = "DATABASE FAILURES";

Figure 4-11. Example Short PDRD PVL

```
EXAMPLE ONLY                                    EXAMPLE ONLY


MESSAGE_TYPE = LONGPDRD;
REQUEST_ID = URF1234;
NO_FILE_GRPS = 3;
DATA_TYPE = LPGS_DATA;
DISPOSITION = "INVALID DATA TYPE";
DATA_TYPE = LPGS_DATA1;
DISPOSITION = "INVALID FILE ID";
DATA_TYPE = LPGS_DATA;
DISPOSITION = "SUCCESSFUL";
```

Figure 4-12. Example Long PDRD PVL

4.3.2.4 Production Acceptance Notification (PAN)

After the data have been ingested and stored by ECS, ECS automatically sends a Production
Acceptance Notification (PAN), via ftp "put" , to the supplier system (i.e., LPGS). The PAN file
announces the completion of data transfer and archival, and identifies any errors or problems that
have been encountered. Unique file names (time-based) are assigned to each PAN using the
same basic file name used for the PDR (the convention is depicted in Table 4-23 and an example
is provided in Figure 4-10), except that the extension will be "PAN."There are two forms of the
PAN available for use, including a short (Table 4-26) and a long (Table 4-27) form. The short
form of the PAN is sent to acknowledge that all files have been successfully transferred, or to
report errors which are not specific to individual files but which have precluded processing of
any and all files (e.g., ftp failure). If all files in a request do not have the same disposition, a long
form of this message is employed. For each file in a file group, if an error is encountered, ECS
halts processing and reports the error which it just encountered for that file. None of the
remaining conditions in that file is validated. ECS processing then continues on with the next
file in the file group. If there are no more files to process in the file group, ECS processing then
continues on with the next file group in the LPGS PDR. The PAN consists of PVL Statements.
Short and Long PAN PVL examples are provided, respectively, in Figure 4-13 and Figure 4-14.

Table 4-26. Short PAN PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	SHORTPAN
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" " METADATA PREPROCESSING ERROR" " RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1.   In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2.   Each parameter/value statement is followed by an EOL mark.

EXAMPLE ONLY   **EXAMPLE ONLY**

MESSAGE_TYPE = SHORTPAN;
REQUEST_ID = URF1234;
DISPOSITION = "POST-TRANSFER FILE SIZE CHECK FAILURE";
TIME_STAMP = 1996-06-23T09:46:35Z;

Figure 4-13. Example Short PAN PVL

Table 4-27. Long PAN PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Long Production Acceptance Notification	Fixed String/ASCII (7)	LONGPAN
REQUEST_ID	Request ID contained in the User Request File (URF)	Variable String / ASCII (20)	unique ID
NO_OF_FILES	Number of Files in PDR	ASCII (4)	TOTAL_FILE_COUNT parameter in PDR

For each File in the PDR

FILE_DIRECTORY	ASCII string specifying file directory location	ASCII (<256) Equivalent to PDR length	DIRECTORY_ID parameter in PDR
FILE_NAME	File names on system creating PDR	ASCII (<256) Equivalent to PDR length	FILE_ID parameter in PDR
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of the data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

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```
EXAMPLE ONLY                                          EXAMPLE ONLY


MESSAGE_TYPE = LONGPAN;
REQUEST ID = URF1234;
NO_OF_FILES = 3;
FILE_DIRECTORY = LPGS 1/L1R_G;
FILE_NAME =(XXXX );  /* per LPGS file definition */
DISPOSITION = "UNABLE TO ESTABLISH FTP CONNECTION";
TIME_STAMP = 1996-04-28T23:49:59Z;
FILE_DIRECTORY = LPGS 1/L1R_G;
FILE_NAME =(XXXX);  /* per LPGS file definition */
DISPOSITION = "ECS INTERNAL ERROR";
TIME_STAMP = 1996-04-28T23:59:59Z;
FILE_DIRECTORY = LPGS 1/L1R_G;
FILE_NAME =(XXXX);  /* per LPGS file definition */
DISPOSITION = "SUCCESSFUL";
TIME_STAMP = 1996-04-28T23:59:59Z;
```

Figure 4-14. Example Long PAN PVL

4.3.3 ECS - LPGS Electronic Data Exchange Security

The ESDIS Security Policy in regards to file transfer is summarized as: Writing to the ECS archive requires a strongly authenticated, e.g., kerberos (kftp) or DCE, client. Any applications in which ECS is polling the LPGS disk, standard ftp login procedures including the use of a password for the purposes of security is used. User IDs and passwords are needed for ftp connections and are maintained by ECS. It is recommended that User IDs and passwords be changed, via the DAAC administrator, periodically (on the order of every six months) or whenever a system compromise is suspected.

5. Data Flow Descriptions

The LPGS produces L1G/L1R Product Data sets after receiving LØR Product Data sets from ECS. ECS then distributes all L1G and L1R products as requested. Figure 5-1 identifies the high level data flows between the ECS and the LPGS to support the order/distribution of Level 1 R/G products. Descriptions of the data exchange framework supporting these flows are found in Section 4 of this ICD. Specific characteristics of each data flow depicted in Figure 5-1 are described in this section, including interface methods, data formats, and error handling conditions.
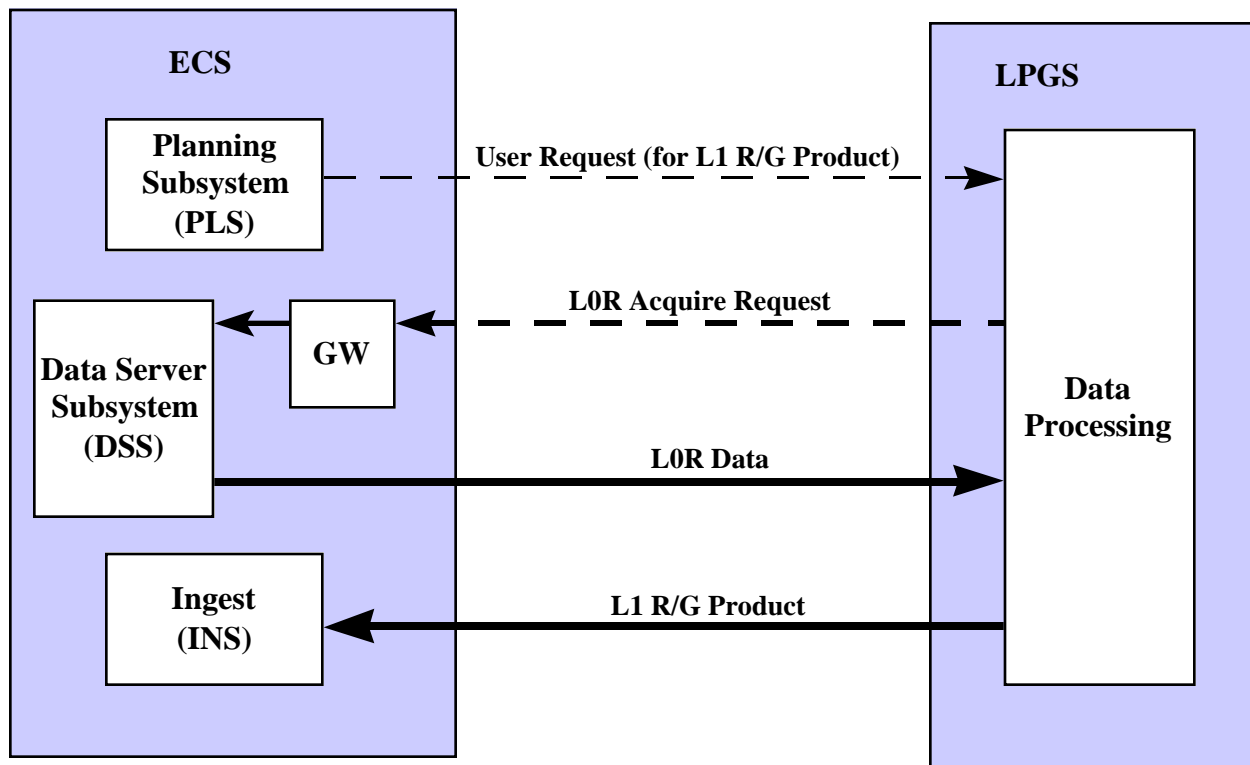
Figure 5-1. Data Flows Between ECS and LPGS

5.1 L0R Product Data Sets

The ECS provides L0R Product Data sets to LPGS for processing into L1G / L1R product data sets as requested. The Level 0R data interface provides the means for the ECS to transfer Level 0R processed ETM+ image data, metadata, and the Level 0R support data, in format-specific data sets to LPGS. Level 0R support data includes Payload Correction Data (PCD), Mirror Scan

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Correction Data (MSCD), and Calibration/DC Restore Data. LPGS uses the Level 0R data to produce the requisite Level 1 R/G product(s).

Specifics related to L0R data characteristics, format, contents, file naming convention, and metadata are described in the Interface Control Document Between EOSDIS Core System (ECS) and the Landsat 7 System, 423-41-32; and the Landsat 7 System Zero-R Distribution Product Data Format Control Book, vol. 5, Book 1, 430-11-06-007-0.

5.2 Level 1 R/G Product Data Sets

The LPGS provides L1 R and L1 G (Level 1 R/G) product data sets to ECS for distribution. L1R products include digital images which have been radiometrically corrected, but not geometrically resampled and associated data files (e.g., metadata, MSCD, PCD). L1G products include digital images which have been radiometrically corrected and resampled for geometric correction and registration to geographic map projections as well as associated files (e.g., metadata, MSCD, PCD). A maximum of 28 user requests for Level 1 R/G products is expected each day. The number of scenes per request will range from 0.5 to 3 (per requirement IMS 2020). The average size of a request is expected to equal 1 scene. The amount of Level 1 R/G data to be received by ECS from LPGS is 38 GB/day. The characteristics of Level 1 R/G products are defined in the Level 1 Product Generation System (LPGS) Output Files Data Format Control Book.

5.3 Operations Concept

ECS supports the LPGS in satisfying user requests for Level 1 R/G products. ECS receives user orders containing specific information, and provides processing requests to the LPGS. LPGS accepts the processing requests, and orders, from ECS, the L0R data needed to produce the requisite Level 1 R/G products. ECS accepts the order, and returns the corresponding L0R data to LPGS. LPGS uses the L0R data to produce the ordered Level 1 R/G products. LPGS returns the Level 1 R/G products, along with associated metadata, calibration and correction files, documentation of Level 1R/G production processing, cancellation requests confirmation, and status of processing requests, to ECS for ingest, temporary storage (i.e., at least 72 hours) and distribution to the user. ECS will temporarily store Level 1 R/G products and product documentation (such as algorithm descriptions and production process software) for the 1R/1G production processes:

 Once an order has been placed, a user may, at any time, cancel the order through ECS. When a user cancels an order, ECS correspondingly cancels individual product generation requests which have been spawned by the original order. Cancellation of product generation requests are either verbally conveyed between ECS and LPGS operators; or manually communicated through e-mail (4.2.1). After an order cancellation request has been initiated, the ECS and LPGS operators are responsible for cleaning up directories and deleting temporary files/products which are associated with the canceled product---this task is accomplished using manual methods.

Once an order has been placed, status information is made available to the user through ECS. It is important to note that LPGS does not expressly provide product processing status

messages/data to ECS. Instead, ECS derives product processing status from PDRs, PDRDs, PANs, and Level 1 R/G products provided by LPGS .

All LPGS/ECS functions are fully automated, unless operator involvement is explicitly specified.

The LPGS interfaces to the ECS Trouble Ticket System. This interface allows maintenance engineers to resolve problems and identify problems through the desired DAAC chain of command in accordance with the DAAC Operations Manual (DID 611). For example, extensive delays, or situations rendering the LPGS incapable or processing product requests will be communicated to ECS manually via the ECS trouble ticket system. Prior to allocating a problem (e.g., logging it against ECS), sufficient analysis will be performed to determine the correct point of origin---a DAAC operator will then log the problem. Alternatively, such problems may be communicated verbally/manually via the EDC DAAC operations/shift supervisor.

The ECS Planning Subsystem (PLS) manages on-demand requests. A minimal amount of operator manipulation on the set of queued requests is provided, including the capability to select specific queued items to be marked for priority processing.

EDC DAAC personnel oversee schedules and ingest operations and coordinate with LPGS to resolve schedule conflicts and ingest problems. Ingest and data validation is amply automated--- human intervention is needed only for problem resolution and media operations. Operations and user services support is provided to support the temporary storage and distribution of the new Level 1 R/G data products. Maintenance and Operations (M&O) personnel provide software maintenance, including sustaining engineering, configuration management and test.

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6. Functional and Performance Requirements

6.1 Requirements Overview

The functional and performance interface requirements identified in this document are traced to the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System. Appendix A, Table A-1 of this document provides a listing of each interface requirement by requirement number and an identification of its parent requirements as found in this document.

The following sections present the functional interface requirements for the ECS to LPGS interface. All requirements use electronic computer controlled processes unless otherwise specified.

6.2 Functional Interface Requirements

LPGS0010   The ECS shall accept user orders for Level 1R and 1G data products

LPGS0020   The ECS shall accept as part of the user order, the following types of information:

    a. user parameters

    b. prioritization

    c. scene id

    d. interval specification

    e. parameter subset specification

    f. orientation

    g. grid cell size

    h. map projection

    i. output format

    j. resampling filter

    k. media type

    l. shipping information

    m. billing information

    n. input granule identification

    o. product selection (L1R, L1G)

    p. band selection

    q. calibration selection

LPGS0030   The ECS shall accept standing orders for Level 1R and 1G data products

LPGS0040   The ECS shall provide pricing for Level 1R and 1G data orders prior to accepting the order.

LPGS0050   The ECS shall accept order cancellation requests from users for previously ordered Level 1R and 1G data products.

LPGS0060   The ECS shall accept order status requests from users.

LPGS0070   The ECS shall provide order status to users

LPGS0080   The ECS shall accept from LPGS, documentation (such as algorithm descriptions) and production process software for the Level 1R and 1G production processes.

LPGS0090   The ECS shall make documentation and production process software available to users on request.

LPGS0100   The ECS shall send processing requests to LPGS for the generation of Level 1G and Level 1R products.

LPGS0110   The ECS shall forward processing cancellation requests to LPGS for production process cancellation.

LPGS0120   The ECS shall receive processing cancellation confirmation from LPGS when the processing is successfully canceled.

LPGS0130   The ECS will query LPGS for the status of processing requests that have been submitted, but not yet received.

LPGS0140   The ECS shall send LPGS the following data as required for the generation of on demand Landsat-7 Level 1G and Level 1R products:

    a. Landsat-7 Level 0R data

    b. Scan Mirror Correction

    c. Calibration Processing files

    d. Payload Correction Data

    e. selected user parameters

    f. metadata

LPGS0150   The ECS shall receive Landsat-7 Level 1G and 1R products and associated metadata from the LPGS.

Note: An order is defined as 1 or more products requested by a user. Orders with requests for multiple products will be broken down into a separate work request for each requested product.   Therefore, order tracking will need to query LPGS for each production request that was submitted according to the ECS-assigned unique request id .

6.3 Performance Interface Requirements

LPGS0160   The ECS shall provide the capability to store Level 1R and 1G products for up to 3 days to support anomaly resolution (see Note 1 below)

Appendix A. Requirements Traceability

ECS/LPGS Interface Requirements	Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
LPGS0010	IMS-0925, IMS-0930, IMS-0940, IMS-0990, IMS-1000, IMS-1005,
LPGS0020	IMS-0925, IMS-0930, IMS-0940, IMS-0990, IMS-1000, IMS-1005,
LPGS0030	IMS-0950, IMS-1080
LPGS0040	IMS-1340, IMS-1350, IMS-1360, IMS-1370
LPGS0050	DADS0525
LPGS0060	IMS-1010, IMS-1040, IMS-1700, PGS-0325, PGS-0410
LPGS0070	IMS-1700, PGS-0325, PGS-0410
LPGS0080	DADS-0110
LPGS0090	DADS-0110
LPGS0100	DADS0680
LPGS0110	DADS0525
LPGS0120	DADS0525
LPGS0130	DADS1020, PGS-0300, PGS-0325, PGS-0410
LPGS0140	DADS2370, DADS2410, DADS2430, DADS2440, DADS2450, DADS2460, DADS2470, DADS2480, DADS0690, DADS0760
LPGS0150	DADS0290, DADS0300, DADS0310, DADS0320, DADS0370, DADS0490
LPGS0160	DADS0450

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Appendix B. Work-off Plan for Release B
ECS-LPGS ICD

ICD Issue #	ICD Para. #	Issue Priority*	ICD Issue Type - Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	4.3 5.3	A	Need to identify what happens in the event that LPGS cannot produce requested L1 products.	LPGS, ECS and ESDIS will coordinate to discuss and resolve issue.	8/31/97	1. Interface design will be incomplete.
2	App C	A	Need to add separate appendix defining L1 metadata to be extracted by ECS, along with parameter checking and search criteria.	ECS to coordinate with LPGS to determine metadata parameter checking and search criteria.	10/31/97	1. Interface design will be incomplete.
3	Tbl 4-2	A	L7 Instrument Team needs to clarify whether output format for L1 products will be in HDF or HDF-EOS. or both.	ECS, LPGS and the L7 IT will coordinate to clarify this issue.	10/31/97	1. Interface design will be incomplete.

* Issue Priority Definition:

        A = Design impact; e.g., unresolved interface.

        B = Minimal design impact; e.g., content or format of a specific field unresolved.

        C = No design impact - administrative detail; e.g., reference document # not available.

** Risk Assessment Definition:

        1 - Risk if issue is not resolved by projected resolution date

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Abbreviations and Acronyms

AR	Acquire Request
ARA	Acquire Request Acknowledgment
CCB	Configuration Control Board
CCR	Configuration Change Request
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CPF	Calibration Parameter File
CPU	central processing unit
CSMS	Communications and System Management Segment
DAA	Data Availability Acknowledgment
DAAC	Distributed Active Archive Center
DAN	Data Availability Notice
DCE	Distributed Computing Environment
DCN	Document Change Notice
DDA	Data Delivery Acknowledgment
DDN	Data Delivery Notice
DFCB	Data Format Control Book
DID	Data Item Description
DSS	Data Server Subsystem
EBnet	Ethernet Backbone Network
ECS	EOSDIS Core System
EDC	EROS Data Center
EOL	end of line
EROS	Earth Resources Observation System
EOS	Earth Observing System

EOS-AM1	EOS AM Project (morning spacecraft series)
EOSDIS	EOS Data and Information System
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
ETM+	Enhanced Thematic Mapper Plus
FDDI	Fiber Distributed Data Interface
ftp	File Transfer Protocol
GB	gigabyte
GUI	Graphical User Interface
GW	gateway
HDF	Hierarchical Data Format
HDF-EOS	Hierarchical Data Format - Earth Observing System
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
I&T	integration and test
IAS	Image Assessment System (Landsat)
IC	internal calibrator
I/F	interface
ICD	Interface Control Document
IMS	Information Management System (ECS)
INS	Ingest Subsystem
IP	Internet Protocol
ISO	International Standards Organization
L0R	Level 0R data product
L1G	Level 1G data product
L1R	Level 1R data product
L1R/G	Level 1R and Level 1G data products
LAN	Local Area Network
LCC	Lambert Conformal Conic

LPGS	Level 1 Product Generation System
LPS	Landsat Processing System
M&O	Maintenance and Operations
MSCD	Mirror Scan Correction Data
N/A	Not Applicable
NASA	National Aeronautics & Space Administration
ODL	Object Description Language
OM	Oblique Mercator (OM)
OSI	Open System Interconnection
PAN	Production Acceptance Notification
PC	Polyconic
PCD	Payload Correction Data
PCMB	project configuration management board
PDR	Product Delivery Record
PDRD	Product Delivery Record Discrepancy
PLS	Planning Subsystem
PS	Polar Stereographic
PVL	Parameter Value Language
RAM	random access memory
SDPS	Science Data Processing Segment
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOM	Space Oblique Mercator
TBD	To Be Determined
TBR	To Be Reviewed, To Be Resolved
TBS	To Be Supplied
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TM	Transverse Mercator

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UR	Universal Reference
URF	User Request File
URFA	User Request File Acknowledgment
USGS	U. S. Geological Survey
UTM	Universal Transverse Mercator
WRS	Worldwide Reference System Scene
WWW	world-wide web